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Occurrence of Oxidized Zinc Ores at Tintic

By Edward R. Zalinski*

SYNOPSIS—Zinc silicates and carbonates are being mined at Tintic. They are found associated with lead ores, often in the bottom of old lead stopes. Ores are all secondary. Smithsonite the most common mineral.

Within the last year zinc ore began to receive attention in Tintic, and this class of ore has been developed and mined by the Yankee, May Day, Gemini, Ridge & Valley and others. During 1912, about 8000 tons of zinc ore averaging 34% zinc were produced from 10 mines, according to preliminary figures by the U. S. Geological Survey. Most of the output was made during the latter part of the year, when shipments amounted to 1500 tons per month. Beside the properties mentioned, zinc ores were shipped by the Uncle Sam, Godiva, Lower Mammoth, East Tintic Development and New Bullion.

The Yankee mine is situated on the east slope of the Tintic Mountains at an altitude of about 7000 ft. The May Day adjoins it on the north, and the Beck Tunnel on the south. The Uncle Sam claims touch the property in places. The Yankee and May Day are on the eastern ore zone of the camp, on the same zone from which silver-lead ores were produced in the Uncle Sam, Humbug, Beck Tunnel, Colorado, Sioux and Iron Blossom properties. The lead-ore channel extends continuously from the Yankee into the May Day, but is not continuous, so far as known, with the Beck Tunnel orebodies on the south. Both the May Day and Yankee have produced considerable silver-lead ore, and have paid dividends amounting to $108,000 and $167,500. Fig. 1 shows the entrance of the main tunnel, shaft, mine buildings, etc., at the Yankee mine. The lead orebodies extend continuously from one property into the other, and the occurrence of zinc ore is similar in both. The zinc ores are found along the bottom and sides of the old lead stopes, and are genetically connected with the lead orebodies. The country rock is limestone, comprised of the Humbug formation and Godiva limestone. These differ somewhat in character and texture, but lead orebodies occur in both. Porphyry covers the surface at the Yankee shaft, and was cut to the 300-ft. level, the remainder of the shaft, 2000 ft. deep, being in limestone. The porphyry is a flow of rhyolite, and is not connected at any point with the orebodies.

Fig. 1. Entrance to Main Tunnel, Shaft and Surface Buildings, Yankee Mine

*Mining engineer, 819 Newhouse Bldg., Salt Lake City, Utah.

Occurrence of the Oxidized Zinc Ores

The zinc ores are all oxidized. The ore occurs in the limestone along the bottom and lower east side of the lead stopes, though zinc occurs in a few places in the hanging wall of the lead ore. In size and shape the zinc deposits are if anything more irregular than the replacement lead orebodies. There is some tendency toward flat or lens-shaped deposits along the bedding of the limestone, parallel in places to the bottom of the stopes. The thickness of the zinc ore varies greatly, ranging from a few inches to several feet. Where northeast fissures or breaks cross the lead orebodies, the thickness of the zinc ore is greater than the average. The ore was not deposited at all points along the bottom of the lead stopes, and the lateral extent of any particular exposure is limited. As often occurs in the Tintic district, little ore is usually blocked out.

The contact of the ore and barren limestone is sometimes well defined, though in places there is an insensible gradation between barren rock and good ore, indicating that there has been an impregnation with zinc carbonate, as well as replacement. At the Lower Mammoth mine, on the opposite side of the range, there is a large tonnage of material of this character, which will carry 10 to 15% zinc. Some of this ore carries 1.5 oz. of silver with 0.5 to 1% lead, and $0.20 or $0.30 in gold.

Smithsonite Forms 90% of the Ore

The ore minerals consist of smithsonite, hemimorphite, willemite possibly, and hydrozincite. There is also a hydrous zinc-copper carbonate, aurichalcite, in fine light-green needles and coatings along cavities in the ore. In the May Day a red mineral resembling zincite, red oxide of zinc occurs, but it has not been determined.

The smithsonite is the most abundant mineral, and constitutes by far the greater part of the ore, being roughly estimated at 90%. The texture of the ore varies from extremely porous to compact, but is usually porous. Cellular structure, cavities with botryoidal, mammillary, and irregularly curved surfaces covered with druses of small smithsonite or calamine crystals are common. Turkey fat, translucent and bright yellow to yellowish green smithsonite, occurs in bands from ⅛ in. to ½ in. thick with a crystalline or fibrous structure, either in radial aggregates or at right angles to the walls.

Banded structure in the ore parallel to the original limestone bedding occurs, and specimens of banded smithsonite and possibly other zinc minerals weighing from 80 to 140 lb. have recently been sent by the Yankee mine to the Smithsonian Institution in Washington. In places this ore is coated with fibrous crystals of aurichalcite. The banded zinc ore is usually grayish, with alternate whiter bands, but is often of the same color as the original limestone, and sometimes retains the folds, fractures, and structure of the replaced rock in the smallest detail. It is much heavier than limestone, and is readily distinguished by its weight. Fig. 2 shows a piece of banded zinc ore with cellular structure, from the Yankee mine.

The oxidized-zinc minerals were undoubtedly deposited originally as sulphide, at a higher horizon than that at which they are now found, and were associated with much larger amounts of the sulphides of lead, iron, etc., forming the original lead orebodies. The deposition took place below the ground-water level. Later this level was depressed or the country raised, which brought the sulphide bodies where they were acted on by surface waters carrying oxygen, so that the ores were gradually oxidized. The iron sulphide first altered to iron sulphate and sulphuric acid. These compounds assisted in the oxidation of the galena and the blende. Part of the sulphates were changed to carbonates by reaction with the limestone. The lead sulphates and carbonates were relatively insoluble, and remained near their original position. The zinc sulphate was much more soluble and was carried to the bottom, and below the lead orebodies, being precipitated there as carbonate by the limestone. Later water carrying silica partly changed the carbonate to silicate.[1]

That the zinc ores are secondary is clearly shown by their position and occurrence, and by the fact that they contain no silver or gold, these being relatively insoluble and remaining in the original lead ore. Under the lead is iron oxide and then the oxidized zinc.

Deposits Closely Related to Lead Bodies

The size of the zinc deposits appears to be related to and dependent to some extent on the size of the original

Fig. 2. Banded Zinc from Yankee Mine

overlying lead orebodies. It is not possible to determine any definite proportion between the two, but under large bodies of lead ore more zinc is to be expected, other conditions being equal. While the zinc ores are relatively close to the lead stopes, and in most cases border them directly, there are some places where zinc ores have been found to extend 30 to 60 ft. below the main orebodies down on the dip of the limestone bedding or along breaks. The zinc occurs largely on the east sides of the lead stopes, showing the influence of leaching along the bedding. The beds dip to the east. There is no gold or silver in the ore at either property. The ore is usually 2 or 3 ft. thick, but may reach 6 ft. and more at certain points. Zinc is found in larger amounts than usual along east-west and northeast breaks, crossing the orebodies. So far no zinc ore has been found independent of the lead stopes, and away from their immediate vicinity.

At the Yankee and the May Day, zinc ore is being mined over a vertical range of several hundred feet from above the tunnel levels down to the 500-ft. level in the latter property. At other mines in Tintic it is found at greater depth, being mined at the Gemini and Ridge & Valley as deep as the 1400- and 1600-ft. levels, and at the Lower Mammoth between the 1400- and 1800-ft. levels.

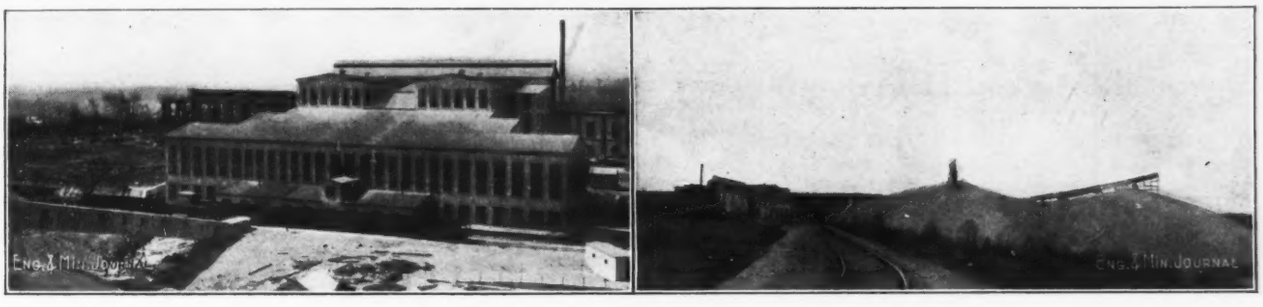
[1]The chemical reactions occurring in a similar process are given by D. Montague Butler in an article, "Some Recent Developments at Leadville," "Economic Geology," January, 1913.

Milling in Southeastern Missouri—I

By Claude T. Rice

SYNOPSIS—In this important lead district the ore is nonargentiferous galena disseminated in dolomitic limestone. The mill heads in the district average 4½% lead. Jigs have always played an important rôle; the Harz type was used exclusively in the early mills, but later the Hancock jig was adopted, because of its larger capacity and lower operating and maintenance costs. The construction of the Doe Run No. 3 mill, one of the newest in the district, is described.

The ore of the southeastern Missouri lead district is essentially a mineralized dolomite, with beds of carbonaceous shale scattered through it. Practically speaking, galena is the only economic mineral, although some of the ore carries as high as 1% zinc, and much of it assays close to ½% zinc. Most of the ore, however, carries no zinc. There is some pyrite in the ore and a little chalcopyrite in some localized areas; sufficient so that at mills handling large tonnages a certain amount of pyrite-blende-chalcopyrite concentrate is made. The galena is scattered through the dolomitic limestone, and while it is called disseminated, the ore is far from having the galena so intimately scattered through the rock as some of the so called disseminated ores of copper. Indeed, finer crushing than about 3 mm. is not required in order to free 95% of the galena. A notable feature is that the galena carries practically no silver. Taking the ore of the district as a whole, it is a remarkably simple one to handle, except that it is low in grade. The average of the mill heads in the district is probably about 4½% lead by wet assay.



No. 3 Mill of the Doe Run Lead Co., Rivermines, Mo.
The halftone at right gives a good idea of the immense size of tailing pile.

General Conditions in District

Among the general conditions in the district which affect milling, may be mentioned the fact that water is scarce. Moreover, the topography, which is only gently rolling, is not well adapted to the building of mills, and in all of them it is necessary to elevate the ore at many points in its passage through the system. The disposal of tailings is also a difficult problem. Power is relatively cheap, for bituminous coal from Illinois can be obtained at low cost.

The labor is unionized and not characterized by any marked abundance of energy and ingeniousness, although the mill men seem to be of a somewhat better type than the miners of the district. The wages paid in the district are low compared to Western wages, but the cost of living is also low. The district is a pleasant one to live in, the only drawback being that good drinking water is scarce. Eight-hour shifts are worked in the mills and mines. The mills run three shifts; the mines work two shifts, six days per week.

Parsons Mill a Pioneer

A brief sketch of the development of the milling practice in the district may be of interest. Jigs have always played a prominent part in the treatment of the ore, and rightly so, for the ore has much coarse galena in it. These jigs were at first of the small Harz type, and the mills themselves were small. Then came the first step toward modern milling when the Parsons mill at Bonne Terre, having a capacity of 1000 tons per day, was built.

This mill which was built along original conceptions, on a flat site, is noted for having the recrushing equipment all brought together on the ground floor together with all the driving shafts; while on the floor above are the concentrating machines with the coarse crushers arranged along one side of that floor. Another feature is the use of the Parsons jig, which obtains its jigging current from a piston that moves back and forth in a sleeve between the two compartments of the jig. In other mills that followed, the large-tonnage scheme introduced at this mill was adhered to, although Harz jigs of larger size were used. As an indication of the rapid progress of the milling art in the district, it may be remarked that the original Parsons mill was designed to have all the ore shoveled by hand into the coarse crushers as no receiving bin was used.

Wilfley tables were introduced about 1897, when they began to demonstrate their ability to handle the finer sizes of mill pulp, following the Harz jigs. About 10 years ago experiments were carried on at the Federal No. 2 mill, now idle, whereby it was hoped to accomplish wonderful results by crushing to 2 mm. and concentration on Bartlett tables. This system was not a success, however, since the galena slimed too badly.

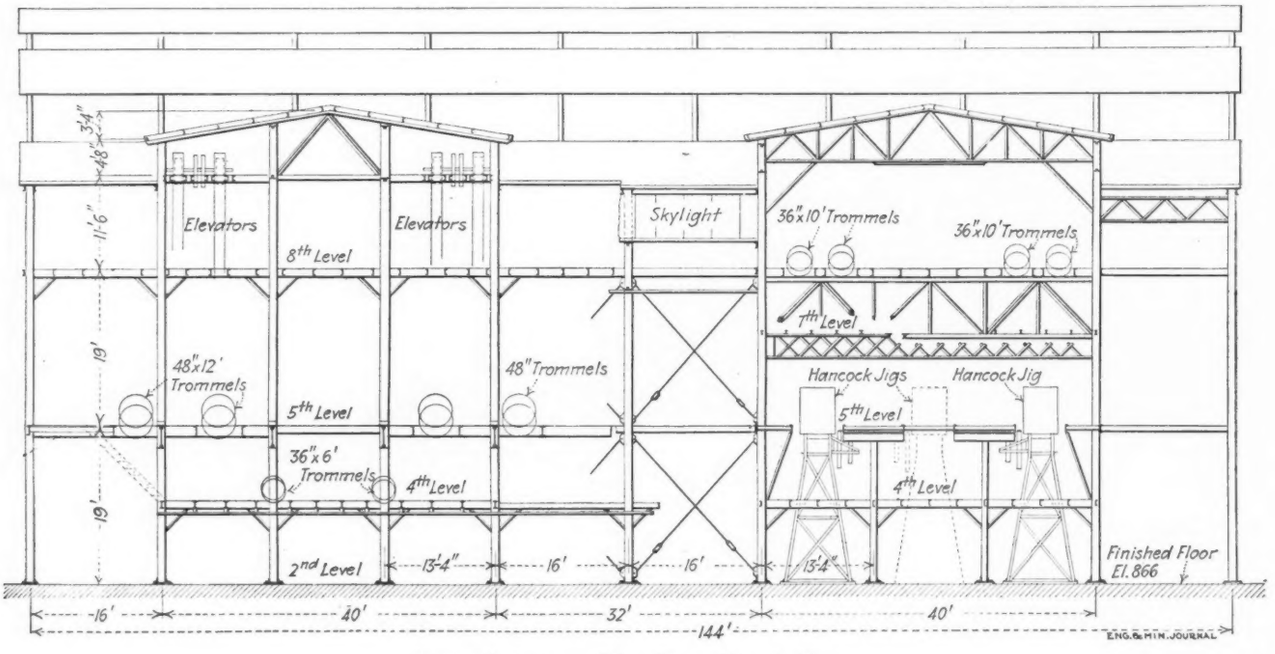
Coarse Crushing and Use of Hancock Jigs

The first real progress in the milling of the ore beyond the general scheme embodied in the old Parsons

mill was the recognition of the principle of crushing coarsely and jigging at 9 mm. O. M. Bilharz is responsible for this advance. This coarse crushing and coarse concentration he embodied in the Leadwood mill as well as in the No. 3 mill of the Doe Run company. The next advance was the introduction of the Hancock jig. The first Hancock jigs were used at the Leadwood mill of the St. Joseph Lead Co. and also by Mr. Bilharz. The first large application of the Hancock jig was in the mill of the St. Louis Smelting & Refining Company.

The trouble with the Harz jig was not that it did not do good work, but that its use resulted in high cost for screens both for jig beds and classification, as well as higher power and wash-water requirements than with Hancock jigs. Moreover, it was found that the Hancock jig, although handling large tonnages, up to 500 tons for 25-ft. jigs, made as good savings as the Harz.

The Desloge Consolidated Lead Co. has a good mill, although it is of a smaller and older type than the ones to be described in detail in this series. In it there is a single Hancock jig to a section, the middlings being returned to the same jig after being recrushed in rolls. Richards hindered-settling vortex classifiers are used with tables and vanners to treat the sand and slime. Mills to be described in this series are in all probability the best lead-concentrating mills in the country.



Cross-Section, Doe Run No. 3 Mill

Doe Run No. 3, Newest Mill

The No. 3 mill of the Doe Run Lead Co., the newest mill in the district, is situated on the hill above Rivermines, St. Francois County, Mo. A gently sloping side-hill site has thus been obtained for the mill, as well as plenty of room for the tailings. This site is near the mine and power plant, its disadvantage being that the tailings must be elevated.

Before going ahead with the milling treatment, I desire to describe in some detail the construction of this mill, which from the mechanical standpoint, when taking into consideration first cost and its bearing upon the amortization charges upon the ore, I consider exceptionally good. The mill is a steel-frame structure with sides of corrugated iron and floors of concrete. The mill has three floor terraces and five galleries, carried by the steel frame.

The lowest floor, or level, is the one on which the middlings tables are placed, as well as the shovel wheels for dewatering the tailings, the settling pit for the overflow from the concentrates hopper, the concentrates sampler and conveyor for loading the dewatered concentrates into railroad cars. The railroad cars also come into the mill on this level. On the floor above, carried at the same height as the second terrace of the mill, the sand and slime tables are placed. The second terrace is the one on which the rolls are mounted and the boots of the wet and dry elevators are carried in pits from this floor. The foundations of the Hancock jigs also start from this second terrace. On the third, or top, terrace, rests the support of the main ore bin, and this terrace forms the crusher-feed floor. The gyratory crushers themselves are carried in pits in this floor with tunnels leading to them for bringing in the conveyors that take the ore to trommels on the fifth floor of the mill. The coarse trommels that feed the crushers are also set upon the third terrace.

On the fourth floor, or the first gallery, are carried the Harz jigs, the mechanism of the Hancock jigs, the dewatering wheel for handling the middlings from the Hancock jigs, and the main mill office. On the fifth floor are the Hancock jigs, the 9-mm. trommels, and many of the motors. The sixth floor is a small gallery floor on which the hydraulic classifiers treating the undersize of the 2-mm. trommels are carried. The seventh is also a small gallery floor above the Hancock jig, on which is carried the spouting for distributing the oversize feed from the 2-mm. trommels to the different Hancock jigs. On this floor are also placed the one-spigot classifiers. On the eighth floor are the 2-mm. trommels. This floor is carried out to the bins in

walks leading to the tracks over the bins, so as to make the whole plant more accessible.

Lockers and change rooms, in which are running hot and cold water, are provided for the men. In the winter the mill building is heated by the Baetz heater system, large pipes taking the heated air, that is sucked past steam-heated coils, to the different parts of the building. Main dependence is placed upon side lighting although the central light court aids greatly in getting light down into the center of the mill building. A commendable feature of the construction is that all gears are protected as much as possible so as to avoid accidents to men, while all motors are railed off and on every floor or gallery handrails are provided where there is danger of the men falling.

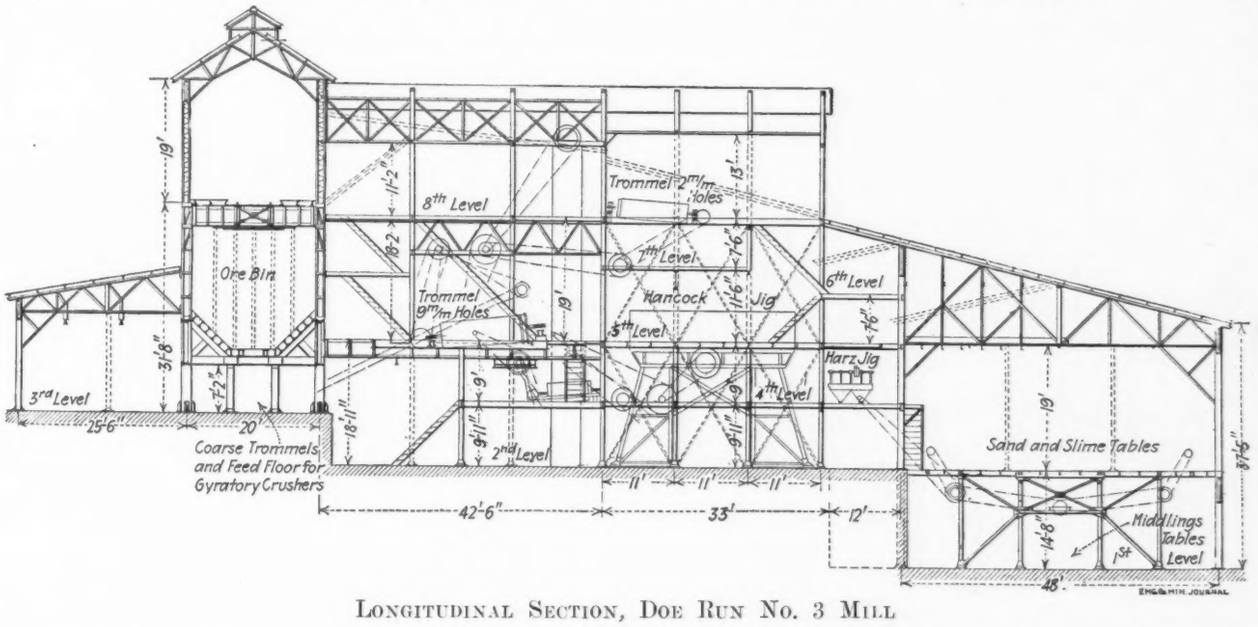
Individual motors are used mainly to do the driving and few line shafts are present. These motors and line shafts are fitted with loose pulleys and friction or spur-jaw clutches are provided so that the danger of putting on belts and such work is greatly lessened. The

In the construction of the mill 4000 cu.yd. of concrete and about 1000 tons of structural steel were used. The mill has a capacity of 2400 tons per day and cost approximately $600,000. The machine shop and the power house cost $8000 additional.

Ore to Mill in Railroad Cars

The ore is hauled to the mill in railroad cars after having received a preliminary crushing to about 3-in. size in gyratory crushers at the shaft houses of the different mines. To determine the tonnage sent to the mill, the number of mine cars dumped into the crusher and delivered by the belt conveyor to the railroad cars is recorded. The weight loaded into a railroad car depends, therefore, upon the amount of ore loaded underground into the mine cars. The approximate weight of the ore in a car is obtained by testing occasionally the weight of different railroad cars on track scales.

This rather rough method of determining the tonnage has to be used as there is no easy way of automatically



Longitudinal Section, Doe Run No. 3 Mill

assembling of the different motors into batteries enables common switchboards to be used and this greatly simplifies the wiring. In all, there are 62 motors in the mill. All transmission and electric-light wires are carried about the plant in pipes and these often serve as a means of supporting the light over some machine. All electrical machinery about the plant is of Westinghouse make.

The electric current for driving the motors throughout the mill is generated at the main power plant, about 1¼ miles distant from the mill, by gas-driven dynamos. The Doe Run company has a large gas-power plant, probably the largest at any mines in the United States. The current is generated and transmitted at 6600 volts and the motors in the mill take it at 440 volts. The transformer room is in the center of the mill building.

Over all heavy machinery, such as crushers and rolls, are carried I-beams for traveling trolleys to which chain blocks can be mounted so as to make the changing of parts and the making of repairs as easy as possible. Back of the main mill building is the power house and machine shop. To aid in unloading the heavy supplies from the railroad cars a boom crane is provided.

weighing the ore, owing to the fact that there is a large amount of dust in the air where any automatic weighing devices of the belt type would have to be installed. Dust interferes seriously with the working of such automatic weighers and agents have not been desirous of installing them. Only the concentrates are sampled automatically at this mill, while dependence is placed upon dipper sampling in testing the pulp and tailing.

From most of the mines the railroad cars have to be hauled upgrade but the tracks are so arranged that the grade is nowhere greater than 3%. The cars are backed in from a Y on to the mill trestle which is large enough to accommodate several cars. The tracks above the mill are put in with a slight grade against the locomotive, so that the cars can be worked ahead with a pinch bar when required for unloading.

While the winters in this section of Missouri are not usually severe, the nights occasionally are cold enough to freeze the ore in the cars if it stands long in them. At such times the ore around the doors is thawed by introducing steam through a pipe nozzle. The railroad cars hold about 40 tons as loaded. Consequently over 60

cars have to be dumped in a day. This dumping is done on day shift, the bin being left filled when the dumpers go off at the end of their shift.

Ore Bin Has Double-Slope Bottom

The ore bin has a capacity of 2500 tons of dry ore. The bin is provided with a doubly sloping bottom, since it was desired to have a bin carry its load balanced, owing to the fact that the bin is built inside the mill building. The flat-bottom type of bin was decided against since it was desired to avoid any shoveling of the ore in case of ore shortage in the mill. The practice is always to keep the bin as full of ore as possible so as to diminish the fall when ore is dumped from the railroad cars.

(To be Continued)

Portland Gold Mining Co.

The report of the Portland Gold Mining Co. for the year ended Dec. 31, 1912, shows that the total net profits were $325,510, out of which dividends to the amount of $240,000 were paid, thus leaving a surplus of $85,510. The No. 2 three-compartment shaft was sunk an additional 100 ft. to the 16th level. During the first half of the year, the 15th level, which had been under water since July 1, 1909, was cleaned up and put into condition for general mining operations. The indications on the new 16th level and the increased size of the orebodies there opened up, lead the company to believe that it is just on top of a permanent enlargement of an orebody, which will compare favorably with some of the large orebodies that have been mined in the past.

Development work to the extent of 7681 ft. was done during the year, divided as follows: Drifts, 4108 ft.; crosscuts, 2462 ft.; raises, 874 ft.; winzes, 139 ft.; sinking, 98 feet.

It was expected to start sinking the No. 2 shaft to the 17th level on Mar. 1, 1913, so as to open up the present known orebody. As a result of the Cripple Creek deep-drainage tunnel, the water level in the Portland property has been lowered 207 ft. during the last two years. It is believed that this tunnel will drain the property to a depth of 600 ft. below the present lowest workings.

The chlorination mill at Colorado Springs, for the treatment of high-grade ore, which had been in operation 12 years or more, has been reconstructed into a cyanide plant. The directors of the company realized that unless this was done, the plant could not continue to compete successfully for custom ore with modern mills. While this reconstruction work was going on, the mill had to treat its normal tonnage of ore in order to take care of the daily shipments received. For several months, therefore, it was necessary to treat the ore by two different processes at the same time, which seriously interfered with the securing of the proper adjustment as quickly as desired. Final adjustments were completed about Nov. 15, 1912, and the results accomplished since that time are stated to have proved the advisability of making the change. After careful investigation, it was decided to install two 200-ton Merrill pressure filters, and they are reported to be giving excellent satisfaction.

The mill at the mine in Victor, Colo., continued to demonstrate its success in handling the low-grade ore. Its capacity was increased from 12,285 tons in December, 1911, to 14,791 tons treated during the month of December, 1912. It was found that larger profits could be made by increasing the concentrating department. To this end, an additional building was constructed, in which 12 concentrating tables were placed. In addition, four Pachuca tanks, one Dorr thickener and two classifiers were installed.

The gross tonnage treated for the year was 173,361 tons, of a gross value of $547,424. The average value per ton of ore treated was $3.15, and the average profit, $1.17 per ton. That the building of the Victor mill for the treatment of low-grade ore was a wise investment is shown by the fact that the mill earned, for the two years of 1911 and 1912, 90% of its entire cost, and the mill has only started on the vast tonnage of low-grade ore available for treatment.

The suit brought by the Portland company against Stratton's Independence, Ltd., for old trespasses committed by lessees of the latter company, has been compromised. By the terms of the settlement, the Portland company receives $5000 in cash, and the right to use about 13 acres of the ground of Stratton's Independence, Ltd., for dump purposes.

Cripple Creek Merger Scheme Unsuccessful

According to information received by prominent mining men here from New York this morning, says the Denver *Post*, June 5, 1913, the proposed mine merger in the Cripple Creek district, including the El Paso and Golden Cycle properties, is off. About a year ago President Allen L. Burris, of the El Paso company, secured an option on the Golden Cycle properties, as well as on several other important but smaller mines in the Cripple Creek district, and proposed a gigantic merger on the theory that one company could operate the properties more economically. He had the support of Joseph Walker & Sons, brokers, of New York, and interested a large number of English capitalists, several of whom visited the Cripple Creek district last fall. Since that time Burris, in conjunction with Walker & Sons, has been working on the proposition, but they have met with much discouragement, and, according to the latest information, have dropped their plan, at least temporarily.

Quarry Accidents in 1911

It is stated by Albert H. Fay (Technical Paper 46, Bureau of Mines) that for 1911 the number of fatal accidents in the United States quarries was 188, the death rate being 1.69 per thousand as compared with 3.73 in the coal mines and 4.19 in the metal mines. Classifying the quarries as granite, trap, sandstone and bluestone, limestone, marble, cement rock and slate, the lowest death rate is obtained in the marble quarries, being 0.63, and the highest in the cement-rock quarries, 3.82. Of the various causes of death, falls of quarry material or overburden formed, 25.5%; explosives, 24.5%; hauling and handling material, 10.6%; and falls of person, 8.5%. Grouping the causes according to location, 72.34% of the deaths occurred in the quarry and 27.66% outside of the quarry.

The Action of Oxidizers in Cyaniding

SYNOPSIS—The real action of oxidizing agents in connection with cyanide solutions has been comparatively unknown and the author has undertaken some experiments to determine the truth about them. The action of permanganate, ferricyanide, peroxide and air is discussed, with the conclusion that free oxygen plays no primary part in the dissolution of gold, and may even have a retarding influence.

The question of the probable benefit to be derived from the use of oxidizers in cyanide solution has troubled operators since the invention of the process. In a recent paper some new light has been shed on the subject. Some time ago the author experimented on an ash obtained from the tailing dump of a local mine, which contained a great deal of reducing matter, and oxidizers with potassium cyanide were employed in the attempted treatment. The effect of the oxidizers seeming somewhat unusual, it was decided to consider the question of oxidizers in general so far as their action in cyaniding was concerned. Potassium permanganate is sometimes used on the Rand as an aid to cyaniding, but how the permanganate aids seems to be imperfectly understood. A method often adopted in practice is to add permanganate to the charge to be leached and then run on the cyanide solution. Cyanide is destroyed and this is a distinct source of loss. With the usual cyanide solutions employed it was found that, on the addition of permanganate, the oxides of manganese do not, after a time, settle out rapidly. Although the precipitate forms moderately rapidly at the commencement, it takes some considerable time before the final small portions settle out. The bulk of this precipitate in a sand charge is therefore arrested toward the top of the charge, while the solution percolates downward. Successive solutions applied to the charge may carry down a small amount of the precipitate and become changed in their power of oxidizing reducers. In any case, it is the solution without oxides which comes into contact with the bulk of the charge, and which is the agent responsible for the extraction of gold.

Treatment Solution Not Improved by Permanganate

In order to determine the oxidizing power of the solution formed by adding potassium permanganate to cyanide solution, potassium ferrocyanide was added to the filtered solution and the ferricyanide formed was estimated. The standard solutions were a 10-gram per liter solution of potassium ferrocyanide and a 40-gram per liter solution of sodium thiosulphate. In each case to the 150 c.c. of 0.235% KCN, permanganate was added, the precipitate filtered off, and the filtrate added to 30 c.c. standard ferrocyanide solution. A blank test was also performed, in which 150 c.c. water was added to 30 c.c. standard ferrocyanide solution, and the volume of thiosulphate solution to satisfy the ferricyanide determined. This figure was deducted from the volume of the thiosulphate required in the various tests, and in Table 1 this deduction has been made. The treatment solution will not, therefore, in the presence of much reducer, have a pronounced effect so far as the oxidation of the reducer is concerned. With a small quantity of reducing matter the solution would be distinctly useful.

It may be suggested that the permanganate added, not in excess, to cyanide solution may result in a solution which will dissolve gold more readily than a solution which does not contain it, but this idea is fallacious, as these experiments will show. Potassium permanganate,

TABLE 1. OXIDIZING TESTS ON PERMANGANATE

Time of Contact between Filtrate and Ferrocyanide Solution	Volume of Thiosulphate Solution Equivalent to Ferricyanide
1.5 hr.	1.0 c.c.
4.0 hr.	1.0 c.c.
23.0 hr.	1.0 c.c.
30.0 hr.	1.0 c.c.
47.0 hr.	1.0 c.c.
26.0 hr.	1.0 c.c.

0.13 gram to 500 c.c. KCN solution, was added to a certain volume of potassium cyanide solution, the cyanide strength being finally 0.2% KCN. This mixture of solution and precipitate is called *A* in Table 2. Another quantity of mixture *A* was prepared, using the same volume of solution. This was filtered and separated into solution *B*, which was made up to 0.2% KCN, and precipitate. This precipitate was added to a fresh cyanide solution, equal in volume to the volume of the solution used in making up mixture *A*. This mixture, the cyanide strength of the solution being 0.2% KCN, is called *C* in the table. Solution *D* was an ordinary 0.2% KCN solution, equal in volume to the other solutions. To each of the mixtures and solutions, *A*, *B*, *C* and *D*, was added a gold cornet, the cornets being of the same weight and similar in all respects. The mixtures were then simultaneously agitated under the same conditions for the same period of time. Table 2 shows the results.

The solution after passing over the permanganate is thus shown to be a poorer solvent than ordinary fresh

TABLE 2. EFFECT OF PERMANGANATE ON SOLUTIONS

Test No.	Gold Dissolved %	Gold Undissolved %
A	100 nearly	Trace
B	56.9	43.1
C	100.0	0.0
D	80.0	20.0

cyanide solution of the same strength. The precipitate, or mixture of oxides of manganese, is evidently the active and useful agent, but its effect in leaching charges, as already mentioned, is negligible. The common method of adding permanganate is not only of little use, but actually harmful in that a certain amount of cyanide is destroyed and the resultant solution is a poorer solvent of gold than an ordinary solution of equal cyanide strength. If, in any particular instance, the use of permanganate is desirable, it should be employed in a different manner, such as by adding water to the permanganate and, after the latter has been dissolved and carried into the charge where it can oxidize reducers, then adding the cyanide.

Potassium Ferricyanide Aids Solution

Potassium ferricyanide is a well known oxidizer. The reaction with potassium cyanide and other substances involved in cyaniding appears to be quite unknown. A pure solution of ferricyanide in water was found to have no action on gold. The addition of ferricyanide to KCN

Note—From a paper by Morris Green, "Journ." Chem., Met. and Min. Soc., So. Afr., February, 1913.

solution always accelerated the dissolving rate of gold in the latter. As an example, in one case 250 c.c. of 0.235% KCN after a period of mechanical agitation dissolved 80% of gold which was added to it, and the same amount and strength of solution acting on an equal quantity of gold, the solution having 0.5 gram ferricyanide, dissolved the entire portion of gold, or 100% in an equal time. Ferricyanide destroys potassium cyanide and introduces reducing matter into the solution, but notwithstanding this, its presence caused the gold to dissolve more rapidly.

The reaction between potassium ferricyanide and potassium cyanide was studied, using first excess of one and then excess of the other. It was found that with the quantities present in the tests now to be described, one molecular weight of ferricyanide reacted with about 1.25 molecular weight of potassium cyanide, using one molecular weight of potassium ferricyanide, the reaction proceeding slowly until the constituent not present in excess disappears. The time required for the reaction to be completed depends upon the concentration of the solutions employed. After establishing that the reaction does take place with different solutions, a solution of one particular concentration was considered in greater detail so as to make the results comparable, although this particular concentration was chosen in an arbitrary manner.

For example, when 0.6 gram potassium ferricyanide was added to 50 c.c. of 0.23% KCN solution, a little protective alkali being present, the KCN was entirely destroyed after about 20 hr., the solution having stood in an open flask. The potassium cyanide evidently acts as a reducer in the reaction, since the destruction of the cyanide was attended by the reduction of a certain amount of ferricyanide to ferrocyanide. Using the above named quantities, namely, 50 c.c. of 0.23% KCN solution and 0.6 gram potassium ferricyanide and allowing the reaction to proceed until KCN could no longer be found in the solution, it was found that, very nearly, 2.5 KCN reacted with 2 $K_3Fe(CN)_6$, 2 $K_4Fe(CN)_6$ being found in the final product. A number of experiments in which solutions were allowed to stand for long periods, up to 75 hr., showed the same results, the ferrocyanide and ferricyanide existing side by side after the destruction of the potassium cyanide. The average of a series of experiments showed that the ratio between the number denoting the actual amount of ferrocyanide formed and the number denoting the theoretical amount of ferrocyanide that would be formed if 2 $K_3Fe(CN)_6$ were changed to 2 $K_4Fe(CN)_6$, was as 59:55. The reaction proceeds either with or without protective alkali.

Reaction Proceeds in Closed Flask

The solutions at the completion of the reaction were never alkaline to phenolphthalein, so that if the carbon dioxide of the atmosphere enters into the reaction, it is not present finally as the carbonate K_2CO_3, but possibly as hydrogen-potassium carbonate, $HKCO_3$. There is a rapid evolution of gas on heating the solution, this being found to consist largely of CO_2, while the remaining solutions become alkaline. This test is also answered by cyanates which were found by conversion to urea, to be present in considerable amount. That CO_2 from the atmosphere does not enter into the reaction was shown by the following experiments.

Several flasks containing the potassium-cyanide and potassium-ferricyanide solutions were closed with tightly fitting stoppers. The solution in each case filled the flask so that there was no air space between the surface of the solution and the bottom of the stopper. The flasks were opened at varying intervals and the solutions examined for potassium cyanide, ferricyanide and ferrocyanide. The reaction was found, under these circumstances, to have proceeded much more slowly than in the previous experiments, in which the flasks were opened to the atmosphere; for example, after 48 hr. the potassium-cyanide strength had fallen from 0.24% to 0.13% KCN. After longer periods the reaction proceeded further. The solution also then became alkaline, due, probably, to the decomposition of cyanate. Two series of experiments were performed; in one case, the amounts of potassium cyanide and ferricyanide were identical with those used in the open-flask experiments. In the other, the ratio of potassium cyanide to ferricyanide was twice as great as in the first instance. In both series, that is, with closed flasks, 2.6 molecular weights potassium cyanide, approximately, reacted with 2 molecular weights of ferricyanide, resulting in the formation of 2 molecular weights of ferrocyanide. The solution as used in the experiments possibly contained CO_2 at the commencement. Besides, the air used was not swept out of the flasks before running in the solutions. The experiments were therefore repeated with additional precautions. The water used in making up the solutions was treated for some time to remove CO_2. Air, free from CO_2, was passed through the flask and the solution of potassium cyanide and ferricyanide was then run in, every precaution being taken to prevent the external air from reaching the solution. After standing for about 50 hr., the solution was examined. No potassium cyanide was left, and the ferricyanide had been converted to ferrocyanide as before.

Reaction Proceeds Without Gas Development

In all the previous experiments much hydrocyanic acid could be detected in the solutions. That the reaction can proceed without the evolution of this or any other gas from the solution is proved by the fact that the reaction takes place in closed flasks filled with the solution. To determine whether there was any tendency toward the evolution of gas, a solution of potassium cyanide and ferricyanide was placed in a gas burette, and a vacuum was formed in one limb and the apparatus left standing 46 hr. Throughout this period very little gas was collected, less than ½ c.c. from 150 c.c. of solution. The change from ferricyanide to ferrocyanide took place as in all previous cases, and, when the experiment was repeated, using different concentrations of cyanide and ferricyanide, the result in every instance was similar to that obtained in the first experiment.

Hydrogen peroxide might be a product of the reaction, but, owing to its decomposition by ferricyanide and ferrocyanide, its presence would not be detected. The solutions were always examined for peroxide, and invariably gave negative results. Several experiments were performed in which peroxide was added to solutions of ferrocyanide, together with varying amounts of potassium hydrate, and the peroxide was always rapidly decomposed. It is suggested that the reaction between ferricyanide and potassium cyanide is represented by the equation:

$$2\,K_3Fe(CN)_6 + 3\,KCN + H_2O = 2\,K_4Fe(CN)_6 + KCNO + 2\,HCN$$

The effect of ferricyanide upon the rate of dissolution

of gold in a solution of potassium cyanide does not appear to be due to any reaction between the ferricyanide and the cyanide. In the presence of reducers, the beneficial effect of any oxidizer is, of course, easily understood, but the use of ferricyanide applied direct to a cyanide solution introduces reducing material, ferrocyanide, into the solution, besides also destroying cyanide. Clennell has stated that potassium cyanate played a part in the dissolution of gold by potassium cyanide. If this statement be a true one, the explanation of the principle underlying the action of oxidizers, in absence of reducers, becomes obvious. Actually potassium cyanate does not accelerate the dissolution of gold in a solution of potassium cyanide, as was shown by a number of experiments.

Potassium Cyanate Does Not Increase Dissolution Rate of Gold

A solution of potassium cyanate in water was found to have no solvent action upon gold. Gold cornets, each weighing 3.2 mg., and of the same nature in all respects, were attacked by the following solutions which were simultaneously mechanically agitated, under the same conditions for 18 hr.; solution *E*, 250 c.c. c.p. KCN solution, having a strength of 0.23% prepared with fresh distilled water. Solution *F*, 250 c.c. c.p. KCN solution of the same strength as the first mentioned, but prepared with old distilled water. Solution *G*, 250 c.c. c.p. KCN solution of the same strength as that formerly mentioned prepared with old distilled water and containing 0.05 gram c.p. KCNO. Solution *H*, as in *F*, + 0.2 gram c.p. KCNO. Solution *J*, same as in *F*, + 0.35 gram c.p. KCNO. Table 3 shows the results following this treatment.

TABLE 3. EFFECT OF CYANATE ON SOLUTIONS

Solution	Strength of Solution at End of Treatment % KCN	Gold Dissolved %
E	0.22	100.0
F	0.22	82.8
G	0.19	82.0
H	0.15	64.0
I	0.15	64.0

It is probable that the so called pure cyanate used in the above tests contained impurities, since, when the experiment was repeated with a different sample of "guaranteed pure" potassium cyanate, no KCN was destroyed; nor was the rate of dissolution of gold in KCN solution influenced by the cyanate. Further tests confirmed these results.

Ferricyanide Action Independent of Reduction by Cyanide

To show further that the action of ferricyanide in accelerating the dissolution of gold is not due to any products of the reaction with potassium cyanide, ferricyanide, not in excess, was added to a cyanide solution and the whole allowed to stand for a couple of days, when the reduction of the ferricyanide was nearly complete, a small portion of the total ferricyanide being, however, still undecomposed. The action of this solution upon gold was compared with that of an ordinary cyanide solution of equal strength, that is 0.2%. With the first named solution 27.4% of total gold was dissolved at the end of treatment and with the latter solution 96.1% of the gold was dissolved, the length of treatment and agitation, of course, being identical in each case. It is obvious that the action of ferricyanide in accelerating the solution of gold is due to some process independent of the reduction of ferricyanide by potassium cyanide.

The detrimental effect of ferricyanide in practical cyaniding is known and for this reason the use of air in addition to ferricyanide gives better results than by the use of ferricyanide alone, because the oxidizer is reduced by potassium cyanide to ferrocyanide, and the oxygen of the air overcomes the influence of the reducer, which is the constituent retarding the dissolution of the gold. The addition of air to bromocyanide does not accelerate the solubility of gold because the reaction between bromocyanide and potassium cyanide does not result in the formation of reducers.

Oxygen and Oxidizing Agents Have Different Effects

Knowing that the solution of chemically pure potassium cyanide in freshly prepared distilled water dissolves gold more rapidly than an older solution, some other solutions were compared to find their dissolving rate. Solution *K* consisted of 250 c.c. freshly made distilled water plus c.p. KCN, the solution testing 0.23% KCN. Solution *L* consisted of 250 c.c. of 0.23% KCN solution, prepared with water that had been exposed to the air for a number of days. Mixture *M* consisted of 250 c.c. of 0.25% KCN solution prepared as *L*, but with 0.15 gram $KMnO_4$, the KCN being made up to the original strength again. Solutions *K* and *L* and mixture *M* were simultaneously mechanically agitated for the same period of time, under the same conditions, with gold cornets which were equal in weight, 3.2 mg. each, and similar in all respects. The result was that with solution *K*, 98.8% of gold was dissolved; with *L* 82.8% was dissolved, and with *M* nearly 100% was dissolved. A fresh quantity of mixture *M* was filtered, the filtrate allowed to stand and the precipitate again filtered off, this being repeated until the precipitate no longer separated. The cyanide strength of this solution was brought up to the strength of the original solution before the permanganate was added. Solution *L* stood side by side with the mixture *M*, so that it was exposed as long as the solution obtained from *M*. The latter solution, which has been found to be a poor solvent for gold, was tested for oxygen, as also were solutions *L* and a freshly made solution *K*. Solution *L* contained 1 mg. of oxygen per liter, while solution *L* contained 7 mg. and solution *M*, 18.2 mg. oxygen per liter. The solution carrying the least oxygen is thus the best solvent. It is, of course, needless to remark that a cyanide solution carrying, in actual cyaniding, but little oxygen, is not necessarily a good solvent, since in the presence of reducers the poor condition of a solvent would be manifest in its low oxygen content.

From the results embodied in this paper, it would appear that the assistance given by oxidizers in the dissolution of gold is of a secondary nature. Unlike free oxygen, oxidizers do not retard the solution.

These last will confirm, in part, the observations of Julian, published in Reports of British Association for Advancement of Science, 1905, in which he states that free oxygen plays no primary part in the reaction of the dissolution of gold, and any assistance given by free oxygen is of a secondary nature, and that free oxygen often exerts a retarding influence. Potassium nitrate, potassium bichromate and potassium bichlorite were found to be without influence upon the solubility of gold in cy-

anide solution. The $KClO_3$ solution contains only K and ClO_3 ions and no Cl ions or, in the words of Dr. Moir, "any substance capable of taking two negative charges will accelerate the process. . . . Those oxidizing agents, such as $KClO_3$, which cannot take up more charges, have no effect."

To account for the effect of the hydrogen in retarding the solution of gold, the hypothesis must be assumed that to dissolve a metal a difference of potential is necessary between two parts in electrical contact with its surface and in contact with the solvent. The solution pressure of the hydrogen opposes that of the gold, so that the current falls off as the hydrogen collects.

The Export Trade of the Steel Corporation

In describing the export trade of the Steel Corporation, James A. Farrell said it did business "from Iceland to the Fiji Islands," with 268 foreign agencies distributed in 60 countries. The value of the Corporation's foreign trade increased from $31,000,000 in 1904 to $92,000,000 in 1912. This volume of trade could never have been developed had the Corporation not been formed, as it would have been impossible for the subsidiaries to maintain foreign agencies on such an extensive scale.

"In the last eight years we have furnished the steel for every steel structure that has been built in Buenos Aires," Farrell said, "and this has been in competition with German, English and French competitors."

Five of the Corporation's manufacturing subsidiaries contributed their products for the Buenos Aires trade, he added, exporting through the United States Products Co. The Tennessee Coal & Iron Co. is being developed with the purpose of manufacturing steel for the Mexican and South American trade.

The Steel Corporation, Farrell continued, had built all the Government buildings and the buildings for the National Exposition at Buenos Aires.

"What do you sell through your Cape Town, South Africa, office?" asked counsel.

"Through Cape Town we dispose of a number of agricultural products, and through Johannesburg, pipes for the diamond and gold mines," he replied. "And we have done a great deal of business with the Government.

"In Peru we sell light rails, sheet iron and tin plate; in Patagonia, corrugated iron and wire. We are supplying the Argentine government with material for a railroad. In Mexico, we do a large business in general wire products. Through Montreal we sell about 60,000 tons of wire products a year, sheet iron, mine rails and sometimes standard rails, when they cannot be supplied by their own corporations. We are now supplying the Canadian Northern Ry. with 25,000 tons of rails shipped by boat from Chicago, and thence by rail to Calgary, where they cost $47.13, delivered.

"In Rio Janeiro we sell wire, considerable rails, railway accessories, tin plate, and street railway supplies. There is a great deal of hydraulic work going on and we erect their rigs for them. We have expert riggers going all over the world doing this class of work. The American Bridge Co., one of our subsidiaries, does a great deal of it. On the north coast of Africa, at Tangiers, and at Morocco and Algiers, at Tripoli, and through our office at Shanghai, we sell about $4,000,000 of our goods yearly.

"China is a great place to get rid of defective material. The Chinese can make a pretty good razor out of low-carbon steel. They shape articles from cast-off wire and furnish a great market for cast-off horseshoes. We do a large business in Australia, and are now supplying 36,000 tons of rails for the Trans-Continental Railway being constructed there. I believe we just got an additional order of 18,000 tons of rail.

"Our engineers are now at Sydney making plans for a bridge. The cost will be between 11 and 12 millions of dollars. At Vancouver we supply much material, but the freight rate from Pittsburgh there is $18 a ton. Material from Liverpool or Antwerp may be shipped for $6 to $8 a ton. After we established our office there we found it necessary to run a steamship service there. Our ships leave about every two months, making stops all along the line. On the return we go into a general merchandizing business. The steamships come back sometimes laden with chalk, and just at present we are bringing in a load of tin plate. We own four ships and we charter two more. The round trip takes from six to eight months.

Mr. Farrell named other agencies in various parts of the world, to which subsidiaries contributed their products. In spite of a preferential tariff in favor of British steel products, the Corporation recently obtained the contract to supply the rails for a new transcontinental railway in Australia, he said, and for the construction of "the greatest bridge in the world," at Sydney.

In consequence of the organization of the United States Steel Corporation, Mr. Farrell said his concern was successful in developing an export trade in the face of the more favorable conditions for manufacture which existed abroad. While the Corporation was getting in 1912 about $4 a ton less on an average for all its commodities in the domestic trade, as compared with the figures for 1904, it had nevertheless succeeded in getting better export prices on account of superior quality in finished grades.

Concentration of Radio-Active Substances

A cheap method for the concentration of radio-active substances, especially from spring water and similar material, is covered in U. S. pat. 1,059,531, issued to Erich Edler, of Heidelberg, Germany. It has been ascertained that radium salts, salts of polonium, and similar materials, are for the most part absorbed when their solutions have been treated for some time with inorganic colloids, such as, for instance, colloidal silicic acid, colloidal trisulphide of arsenic, colloidal peroxide of manganese, or with organic colloids, such as, for instance, acetyl-cellulose. If absorbing colloids are chosen, which, owing to their chemical nature, can be volatilized without leaving any residue (for instance, silicic acid as fluoride, arsenic as thichloride, nickel and iron as carbonyl compounds, or aluminum as chloride), the radio-active substance in question will be obtained in a highly concentrated state as a residue of the volatilization process. Organic colloids, such as, for instance, acetyl-cellulose, or gelatin, can be removed in a simple manner by ignition.

Lubrication at Steptoe Concentrator

By A. G. Marsh*

SYNOPSIS—The large amount of machinery in this concentrating plant of the Nevada Consolidated made a systematic method of lubrication necessary if economy was to be attained. The lubricating department has 25 employees. A definite routine followed. Dripping oil to the extent of 850 gal. per month caught and filtered. A saving of 20% in lubricant cost followed the installation of the system described.

The concentrator of the Steptoe Valley Smelting & Mining Co., the reduction company of the Nevada Consolidated Copper Co., consists of four units, two sections to the unit, with an average capacity of 10,000 tons of ore per 24 hr., with all sections running. In order to show the magnitude of operations at this plant and to give an idea as to the necessity of systematic lubrication, a brief outline of the machinery involved is given in the accompanying table, which appears on page 1239.

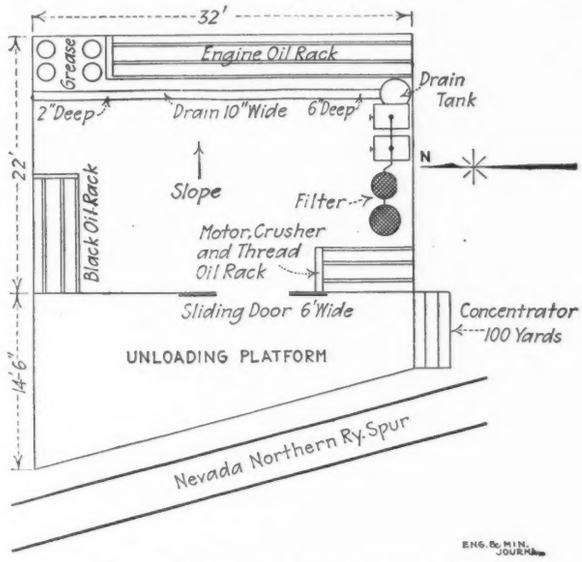


Fig. 1. Plan of Oil-Storage Building

Storage of Lubricants

All oil used for lubrication at the plant is received in steel drums in carload lots from the distributing center at Ely. Each drum is stamped with an individual number, and it is also marked on one end with the number of gallons of lubricant contained; both of these figures are recorded during unloading and are later compared with the invoice received at the general office. The net weights of grease and gear paste, which are received in wooden barrels, are similarly recorded.

The concentrator oil house is situated about 100 yd. from the center of the north end of the mill, adjacent to a Nevada Northern Ry. spur, with its floor and unloading platform on a level with the floor of the ordinary box-car in which lubricants are received. The building is 32 ft. long by 22 ft. wide, of 6x6-in. framework, covered with corrugated iron and provided with a concrete floor. Fig. 1 shows the general arrangement of the interior. The floor is given a gradual slope from the front of the building to the rear, where there is a drain 10 in. wide, two inches deep at one end and six inches deep at the other where it discharges into a steel tank sunk in the floor. Waste oil finding its way to this tank is taken out periodically and put through the filter.

After unloading a car, the oil racks are first filled up and the remaining drums stored outside until needed. There are three oil racks, constructed of 4x6-in. timber, their tops two feet above the floor. There are separate racks for the two classes of oil used in large amount, engine oil and black oil, the former for use on line shafting and the higher-speed machinery, the latter for use on rolls, slow-moving line shafting, etc. The third rack contains the lubricants used only in small quantity, such as crusher oil, motor oil, etc. Grease, gear paste, etc., are kept in open barrels in one corner where is also hung a spring balance reading to ½ lb., by which it is measured out.

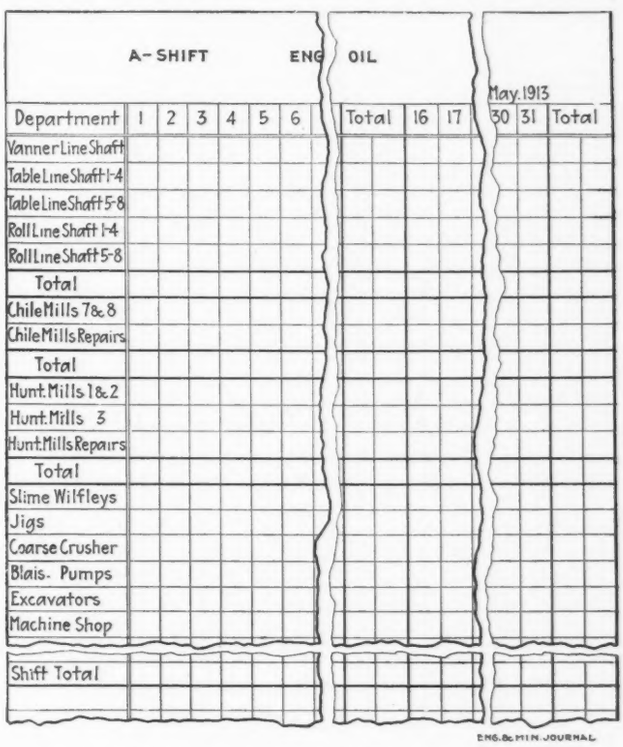


Fig. 2. Daily Record of Lubricants Issued

At the south end of the building is the oil filter, connected with two steel drums which contain the surplus filtered oil. The filter is operated by a laborer whose duty it is to collect oil from the drip pans of the line shafts and Wilfley tables in all parts of the mill and put it through the filter.

Line Shafting, Etc., Oiled by Special Operators

Wherever practicable, the oiling of the various machines in the concentrator is done by the operators. Lubri-

*Mining engineer, Box 257, McGill, Nev.

cation of line shafting, conveyors, regrinding-mill pinion shafting and elevator head-pulleys and gearing, is done by regular shift oilers. For this purpose the mill is divided longitudinally into three divisions for the line shafting of the vanners, tables and rolls.

Vanner line shafting, consisting of six lines of shaft extending through eight sections of the mill, is oiled by a single oiler on each 8-hr. shift. Table line shafting includes the chilean-mill line shafting on two sections, regrinding-roll line shafting on three sections, five lines of table shafting on all sections and the guard trommels. The lubrication of this division is done by two oilers per shift.

Roll line shafting includes also one line of table shafting on eight sections, roll- and sand-elevator head-pulleys (four elevators per section), and the countershafts which operate the No. 1 trommels, the No. 2 trommels and the 20-in. inclined conveyors. Cup grease is used on these latter three shafts, engine oil on the primary and secondary roll drive-shafts and on the elevator head-pulley bearings, and gear paste on the gears of the head-pulleys, and on the dewatering-wheel bearings, which are also included in this division. The work is handled by two oilers per shift. There is used by the oiler on the vanner line shafts 2 gal. of engine oil per 24 hr.; by the oilers on the table line shafts, sections 1 to 4, 2¾ gal.; sections 5 to 8, 3¾ gal.; by the oilers on the roll line shafts, sections 1 to 4, 3 gal.; sections 5 to 8, 3¼ gal. Reports showing the amount of oil used by each of these oilers are issued semimonthly and these, by stimulating competition, tend to keep the oil consumption at a minimum. Careful supervision prevents this taking place at the expense of the bearings, the line-shafting lubrication being in charge of a head oiler who is held responsible for the condition of all bearings and drip pans in his department.

In the coarse-crushing department, an oiler is employed on each shift, there being two shifts in this department, to look after the lubrication of the crushers and conveyors. The oiler on day shift has an assistant whose duty it is to fill the grease cups on the conveyors and apply gear paste to their gearing. The remaining conveyor, operating underneath the bins and feeding the sections, is in charge of an oiler on day shift only.

The lubrication of sand elevator-boot pulleys and gear shafting of the Huntington and chilean mills is in charge of two oilers, the day oiler working from 7 a.m. to 4 p.m. and the night oiler from 8 p.m. to 4 a.m., the latter covering half of each of the two night shifts. The total number of employees engaged in lubrication is 25, including the oil-house man, the filter man and the man in charge of lubrication.

STEPTOE VALLEY SMELTING & MINING CO.
MCGILL, NEV.
MONTHLY LUBRICANT CONSUMPTION
DATE _____ 19__ CONCENTRATOR DEPARTMENT

Lubricant	Period of Use	Vanner Line Shaft	Table Line Sh 1-4	Table Line Sh 5-8	Roll Line Sh 1-4	Roll Line Sh 5-8	Total Line Shaft	Rolls 1-8	Chilian Mills	Huntington Mills	Regrinding Rolls	Gallery Wilfleys	Roll Floor Wilfleys	Mill Floor Wilfleys	Vanners	Sand Elevators	Roll Elevators	Coarse Crusher	Trestle Conveyor	Section Conveyor	Jigs	Rigsdell Pumps	Excavators	Shops	Total Lubricants	COST
Engine Oil	1st half																									
	2nd half																									
	Month																									
	Cost																									
Filtered Electric Oil	1st half																									
	2nd half																									
	Month																									
	Cost																									
Total Engine Oil																										
Black Oil	1st half																									
	2nd half																									
	Month																									
	Cost																									
Soft Grease	1st half																									
	2nd half																									
	Month																									
	Cost																									
Gear Paste	1st half																									
	2nd half																									
	Month																									
	Cost																									
TOTAL	TONS																									

Miscellaneous	Period	Motor Oil	Hard Grease	Crusher Oil	Nordberg Cylinder Oil	Nordberg Engine Oil		
	1st half							
	2nd half							
	Month							
	Cost							

Non-Lubricants		Coal Oil	Thread Cutting Oil	Drill Paste	Total		
	1st half					Total Monthly Lubricant Cost	
	2nd half					Cost per 1000 Tons Ore Milled	
	Month					Tons Ore Milled	
	Cost						

FIG. 3. FORM OF MONTHLY SUMMARY OF LUBRICANT CONSUMPTION

SYSTEMATIC METHOD OF OIL DISTRIBUTION

The method of oil distribution recently installed provides each operator with an individual locker in which to keep a daily supply of oil allotted to him and any surplus over the amount required for the shift's oiling. These lockers, built in groups of three, one for each of the three shifts, are placed conveniently with regard to the work of the men for whom they are provided. A keyboard is also provided for each shift with the keys for all operators arranged in order and tagged. The three keyboards are hung near the shift foreman's office, by which the men must pass on their way to and from work. A duplicate of each key is kept in the office so that in the case of a lost key, a new one may be made.

For convenience in handling the oil, the mill is divided

into three departments or floors, i.e., roll floor, mill floor and vanner floor, each provided with an oil table and cupboard centrally placed Each operator is provided with a carrying can tagged similarly to his key, and with a surplus can kept in his locker at all times. The carrying cans for all shifts are brought filled from the oil house to the mill during the day shift, those for use on day shift being placed on the tables, the others locked up in the cupboards under the tables. The regular floor bosses on each shift superintend the distribution of the cans from the oil tables to the operators. Several Greek laborers from each department—four from the roll floor, three from the mill floor and two from the vanner floor carry the cans between the oil house and the oil tables. This requires three trips per day, one for each shift, two at the beginning of the day shift, and one at the beginning of the afternoon shift, each trip taking about 15 or 20 minutes.

This system does away with the former practice of the operators of leaving the floor to get their own oil from the oil house. A saving in time results and each operator is made responsible for the amount of oil allotted to him. Furthermore, the man in charge of the oil house can

Lubricant	On Hand May.1	Rec'd. May.1-15	Credits	Total	Used May.1-15	On Hand May.16	Rec'd. May16-31	Credits	Total	On Hand June 1	Used May16-31
Engine Oil											
Black Oil											
Crusher Oil											
Motor Oil											
Cup Grease											
Gear Paste											

ENG. & MIN JOURNAL

FIG. 4. INVENTORY FORM

control absolutely the disbursement of oil. At the end of the shift, any unused oil is emptied into the surplus can. When an amount equal to the shift allowance has been thus accumulated, it is used.

CLOSE RECORD KEPT OF OIL DISTRIBUTED

The system does not apply to the shops and other irregular lubricant users, these obtaining their supply direct from the oil house as needed. A record of all lubricants given out is kept in a book with 10x12-in. pages, ruled in ¼-in. squares. Each month certain pages are ruled up, as shown in Fig. 2, a separate page being devoted to each shift for each class of oil used, except in the case of lubricants used only on day shift and in small amounts, such as cup grease, gear paste, motor oil, etc. The record is designed to permit of semimonthly reports; necessary, on account of the shift change, which occurs on the first and sixteenth of each month. These semimonthly reports follow the same general plan as the daily record except that department totals only are shown, instead of those of the individual operators. The two semimonthly reports are further combined, Fig. 3, in one sheet.

OIL DRIPS CAUGHT, FILTERED AND USED AGAIN

Wherever engine oil is used extensively, as on line shafting, Wilfley tables, etc., drip pans are provided to recover waste oil, which is filtered and used again on the vanners, elevator-boot pulleys and slow-moving shafting. About 850 gal. per month are thus recovered. In making out the semimonthly reports, this recovered oil is deducted from the amount used by the department where it is obtained and it is then charged at the original price to the department where finally used.

The total of the figures furnished by the daily record cannot be relied upon for use in the semimonthly report, owing to the discrepancies that occur in measuring out so many small quantities. This is overcome by taking inventories, and changing proportionally the daily record totals.

In making the inventory, the form of which is shown in Fig. 4, the contents of partly filled drums are ascertained by means of a measuring rod graduated to read gallons direct, when inserted through the side of the lying drum, an average capacity being assumed for all drums. In the case of grease and gear paste a scale is used based on the net weight contained in the average-size barrel, i.e., 380 pounds.

MACHINERY REQUIRING LUBRICATION

Coarse-Crushing Department
- 2 No. 7½ McCully gyratory crushers.
- 250 ft. of 36-in. conveyor; speed, 107 ft. per min.
- 500 ft. of 24-in. conveyor; speed, 387 ft. per min.
- 800 ft. of 24-in. conveyor; speed, 450 ft. per min.

Section Bins
- 800 ft. of 18-in. conveyor; speed, 138 ft. per min.
- 250 ft. of 20-in. conveyor; speed, 183 ft. per min.
- 8 Challenge feeders.

Fine Crushing
- 8 rolls, 36x15 in.; speed, 85 r.p.m.; set ⅜ in. apart.
- 8 rolls, 36x14 in.; speed, 100 r.p.m.; set 7/16 in. apart.
- 8 rolls, 36x14 in.; speed, 120 r.p.m.; set ½ in. apart.
- 6 rolls, 36x15 in.; speed, 165 r.p.m.; set close.
- 16 elevators; height, 61 ft.; belt speed, 400 ft. per min.
- 253 shafting bearings.

Screening
- 16 trommels, 42x84 in.; ⅜- and 7/16-in. round holes; 18 r.p.m.
- 64 trommels, 36x72 in.; 2-mm. round holes; 20 r.p.m.
- 16 trommels, 36x72-in.; 20-mesh wire; 16 r.p.m.

Concentrating
- 12 Traylor jigs, 2-compartment; speed, 216 strokes per min.
- 12 Janney classifiers.
- 380 Wilfley tables; speed, 250 strokes per min.
- 190 Wilfley tables; speed, 280 strokes, per min.
- 85 Frue vanners; speed, 185 to 200 strokes per min.
- 270 Allis-Chalmers suspended-type vanners; 116 to 124 strokes per min.
- 10 slimers.
- 6 Wilfley line shafts, each 785 ft. long, averaging 86 bearings each.
- 6 vanner line shafts, each 785 ft. long, averaging 87 bearings each.

Regrinding
- 10 six-foot Garfield chilean mills.
- 10 six-foot Huntington mills.
- 6 rolls, 36x15-in.; speed, 165 r.p.m., set close.
- 16 elevators; height, 50 ft.; speed, 440 ft. per min.; shafting for above.

Excavators
- 2 Blaisdell excavators for discharging tanks 28 ft. in diameter and six feet deep.

Pumps
- 3 ten-inch Worthington volute, single-stage.
- 6 six-inch turbines, two-stage.
- 1 Nordberg, horizontal, cross-compound; capacity, 5000 gal. per min.

During the seven months since the introduction of the locker system, the average cost of lubricants per unit of ore milled has been over 20% less than the average cost for the previous seven months.

May Day Mining Co.

The annual report of the May Day Mining & Milling Co. for the year ended Mar. 31, 1913, shows that the 2649 tons of lead ore shipped returned $20,500, and the 5500 tons of zinc ore, $90,113. Receipts from other sources made the total $111,170. The net profit was $37,303, out of which a dividend of $24,000 was paid. This year witnessed the first shipments of zinc ore from May Day. Regular shipments commenced about the middle of October, after the freight rates had been satisfactorily adjusted. Since then from 800 to 1000 tons per month have been shipped.

It is stated that the zinc ore is found from the upper workings, 100 ft. above the hoist level, down to the 500-ft. level. It follows generally the old stopes of lead ore, but occasionally extends away from them. The ore is continuous, in some places being 20 ft. thick and in other places narrowing to 2 ft. It is estimated that there are still 10,000 tons of this ore available for shipment. This does not include the quantity of low-grade zinc ore in the mine, assaying from 18 to 22%. The minimum grade shipped under the present contract is 28%. A fine body of lead ore is reported between the 1000 and 1100 levels.

The May Day company changed its power from steam to electricity and installed an electric hoisting engine and a power line to connect with the Knight Power Co.'s line. It is estimated that the change has cut the operating expense from about $400 down to approximately $235 per month.

New Mine & Metallurgical Construction

Big Eye Mining Co.—A stamp mill with regrinding machinery and a cyanide plant were recently completed and are now in operation at this property, 50 miles northeast of Yuma, Ariz.

Bonanza—The 20-stamp mill building, destroyed by snowslides at this property, near Trinity Center, Calif., last winter, is being rebuilt.

Tightner—The 10-stamp mill at this property at Alleghany, Calif., will be enlarged.

American Potash, Inc.—The first unit of a plant for reducing kelp to potash and other byproducts, will be completed at Long Beach, near Los Angeles, Calif., about July 15. It will have a capacity for handling 500 tons of kelp per day.

Big Five Mining & Tunnel Co.—A 250-ton Edison mill is to be built by this company, at the portal of the Central tunnel, at Idaho Springs, Colo.

Colorado Gold Mining & Development Co.—A 50-ton mill is to be built on the Free Coinage dumps, at Altman, in the Cripple Creek district, Colo. The crushing capacity will be 100 tons per 8 hr.; the agitating and concentrating capacity will be 50 tons per 24 hr., but will be increased later.

Marshall Lake Mining Co.—This company expects to build a small mill on its property, near Lewiston, Idaho.

Ahmeek—This company's stamp mill, in the Lake Superior copper country, is being enlarged.

Yellowstone Portland Cement Co.—A contract for a cement plant has been let to George Woody, of Butte, Mont. The plant will be built near Livingston, on the outskirts of Yellowstone Park.

Comstock-Phoenix—The Fischer mill, on the Comstock Lode, Nev., is to be reconstructed so as to enable this company to treat 50 tons of ore daily.

Longfellow Gold Mining & Milling Co.—This company has under construction, at Carman Heights, Douglas County, Nev., a 50-ton mill, which will treat ore from the company's property. The mill is expected to be in operation Aug. 1.

Aurora Consolidated Mines Co.—A contract has been let for building a 500-ton mill, at the property of this company, near Aurora, Nev.

Rochester Milling & Reduction Co.—This company will build a 20-stamp custom mill of 100 tons daily capacity, at Rochester, Nev.

Maxwell Land Grant Co.—Ten stamps are dropping in this company's mills, near Elizabethtown, Colfax County, N. M., and plans are being made for installing 10 more stamps.

Gray Top Mining Co.—A 500-ton mill is being built at the property of this company, at Miami, Oklahoma.

Lost Trail Mining Co.—A mill is being built at the property of this company, at Miami, Oklahoma.

New Brunswick Shales Co.—It is reported that this company will build a distillation plant in Nova Scotia, to treat 1500 tons of oil shale daily.

Pike Lake Gold Mines, Ltd.—It is the intention of this company to build a mill in the Swastika district, Ontario, as soon as the engineer states that there is sufficient ore blocked out to keep a mill running.

Amajac Mines Co.—Machinery for a 50-ton cyanide plant for this mine, in the Hostotipaquillo district, State of Jalisco, Mexico, will be installed.

Magistral-Ameca Copper Co.—The rebuilding of this company's mill, in the Hostotipaquillo district, State of Jalisco, Mexico, has been completed.

San Gregorio Mining Co.—Plans for a 100-ton reduction plant, at the San Gregorio mine, in which Dwight Furness, of Guanajuato, Mexico, is interested, have been completed, but owing to the unsettled condition of the country, it has been decided to hold these plans in abeyance until there is a decided change for the better.

California Oil in April

The total net production of petroleum in all California fields in April (30 days) was 7,512,696 bbl., a decrease from March (31 days) of 51,360 bbl., but an increase in daily average production of 6422 bbl. The April shipments amounted to 7,344,980 bbl., a decrease from March of 10,944 bbl. The losses in April were 104,884 bbl., an increase over March of 24,717. The total outgo in April was 7,449,864 bbl., an increase over March of 13,773. The total stocks on hand at the end of April amounted to 48,219,812 bbl., an increase over March of 62,832 bbl. The field records for April showed 50 new rigs, 265 wells drilling, 380 wells on which drilling was suspended, 50 wells completed, 6049 wells producing, 883 wells capable of producing but idle, and 15 wells abandoned.

CALIFORNIA OIL PRODUCTION BY FIELDS

District	Bbl.
Fresno County—	
Coalinga	1,507,539
Kern County—	
Midway	2,451,227
Kern River	763,260
Maricopa	483,757
Lost Hills-Belridge	391,516
McKittrick	370,379
Total Kern County	4,460,139
Santa Barbara County—	
Santa Maria-Lompoc-Cat Cañon	399,442
Summerland	4,350
Total Santa Barbara County	403,792
Southern Fields—	
Olinda-Brea-Puente	512,868
Coyotes-La Habra	245,217
Salt Lake-Sherman	216,629
Ventura	71,470
Whittier	54,789
Los Angeles	31,842
Newhall	8,411
Total Southern Fields	1,141,226
Total All Fields	7,512,696

PHOTOGRAPHS FROM THE FIELD

HYDRAULICKING AT COBALT IN PROSPECTING FOR NEW VEINS

Hydraulic giant or monitor is now used in mining operations for clearing débris from the surface of rock or ore in Ontario, Idaho, California, and has lately been used on the Minnesota iron ranges.

HYDRAULIC GOLD MINING AT ROSS, WESTLAND, NEW ZEALAND

Where water under pressure can be secured in quantity and where slope of bedrock and débris-disposal facilities are favorable the monitor holds its own for working auriferous gravels.

The Financial Situation

Sir George Paish, editor of the *Statist* and an eminent authority on financial matters, said in an interview with the correspondent of the New York *Sun*, on June 4:

Fundamentally London is sound, probably sounder than or quite as sound as New York. It is true that new issues of capital in London in recent months have been on a great scale and that a little rest is now needed to permit this stock to be digested. This is likely to occur now, as the issuing houses are giving no encouragement to fresh borrowings for the present. By autumn the whole of the stock which has accumulated will probably have found a permanent home in investors' security boxes.

For the first five months of 1913, the new issues put out in London amounted to nearly $750,000,000, as against $520,000,000 in the corresponding period of 1912 and $550,000,000 in the same period in 1911. The amount of new securities which the British investors can absorb every year is about $1,100,000,000. In fact, in 1912 it was $1,055,000,000, in 1911, $980,000,000, and in 1910 $1,160,000,000. It is probable that by autumn the stock which has accumulated will have been sold to investors, and London will be again prepared for large fresh issues.

The cause of the existing situation lies in the United States and the continent of Europe. In recent years America, France and Germany subscribed large amounts for new enterprises, but since the war in the Balkans these countries appear to have lost their nerve. At any rate they have not provided the normal amount of capital for new enterprises. The result has been that borrowers have had to resort to the London market to satisfy their needs to a much greater extent than usual. Fortunately London has maintained its reputation for enterprise and willingness to lend even in periods of difficulty and large loans by London have to some extent prevented the monetary stringency throughout the world from becoming more severe than it has been.

Briefly, the stringency of the capital market and the heavy fall in securities that has resulted are entirely due first to the Balkan war, which seriously alarmed continental investors and made them wish to keep their resources liquid; and, secondly, to the caution of American investors who for international as well as national reasons have not been disposed to invest as freely as usual.

Whether or not the money stringency will become more severe than it is now will depend on whether or not French, German and American investors recover their nerve and are willing to provide the normal amount of new capital. It is desirable that all responsible persons shall assist in the work of restoring confidence and thus enable the world to obtain that which is essential to its progress.

European statesmen are now alive to the necessities of the situation and are putting forth every effort to bring about a satisfactory settlement of all outstanding questions connected with the Balkans. At no time in modern history has the international political situation in Europe been so hopeful as at present and if, as anticipated, Servia and Bulgaria come to terms with the assistance of the great powers, the reasons for financial prudence from the viewpoint of international politics will entirely disappear.

An American view of the same matter is given in the financial pages of the *Evening Post*, which are ably conducted by Alexander D. Noyes, himself a distinguished American economist, as follows:

What has been going on in the Stock Exchanges is, therefore, a normal movement of relief, though a sufficiently disagreeable one. But the obvious corollary to the principles as just set forth is, that prudent people who have capital at their disposal, who do not need to devote it to their business, and who are capable of judging intrinsic values, are in the distinct position of advantage. This is why steady buying and frequent abrupt recoveries occur, at times of seeming uncertainty and despondency such as now exist.

The clear understanding which has displayed itself this week on all the markets as to the real cause of the present financial unsettlement, ought to put an end to the talk, especially at Washington, as to an "artificial panic" The trouble which has arisen is not artificial, and it neither is nor will be a "panic," and nothing could be more futile and mischievous than the coupling together of the two misstatements. What opinion may be held by statesmen like Senator La Follette, to whom modern finance is a world of evil spirits and wicked magicians, is doubtless a matter of curious conjecture, but it need not interest anyone not subject to delusions. What serious people are looking for is facts.

Nor is it true that people conversant with the facts of the situation are imputing the Stock Exchange disturbance to the impending changes in the tariff. Any change in the tariff, up or down, makes for temporary unsettlement in a season's plans for trade, and therefore the business community's real interests are bound up with the speedy enactment of the bill. But the influence of Europe's financial embarrassments is perfectly well known to be paramount. It is the Eastern markets of the United States which are closest in touch with these foreign markets, which have to absorb the mass of American securities thrown over by foreign holders, and which must surrender the capital withdrawn by foreign lenders. This is the sole and simple explanation of the paradox which amazes every Westerner visiting New York—the fact that he leaves a cheerful and care-free community behind him, and finds himself in another community, where gloom and despondency are the only watchwords of the day.

In 1911 Sir George Paish estimated the annual savings of the American people at $5,000,000,000, of which about $2,000,000,000 is required for housing the increase of population and about $1,100,000,000 for railway, tramway and municipal improvements.

Calumet & Hecla Mining Co.

The report of the Calumet & Hecla Mining Co., of Michigan, for the year ended Dec. 31, 1912, shows that the company produced 67,856,429 lb. of copper, selling it at from 14⅜ to 18c. per pound. Four dividends were paid during the year amounting to $42 per share. During the year the company acquired the remainder of the stock of the Frontenac, Manitou and St. Louis companies. The total mining cost, exclusive of construction, was $1.91 per ton. The average content of the ore, of which 2,806,610 tons were treated, was 24.18 lb. of copper per ton. Construction cost amounted to 0.8c. Total cost per pound of copper produced was 9.86c., and the price received for copper was, on the average, 16.65c. per pound.

In the recrushing plant there were 481,320 tons of coarse tailing crushed, which contained 12.86 lb. of copper per ton, and from which 4.48 lb. of copper per ton were saved. The total production was 2,155,292 lb., and the cost, exclusive of smelting and selling, was 4.99c. per pound.

The foundation and nearly all the steelwork for the new recrushing mill, 123 ft. by 432 ft., has been erected, and part of the building closed in. The foundation for the "shore plant," at which point the sand will be taken from the lake and conveyed to the mill, has been finished.

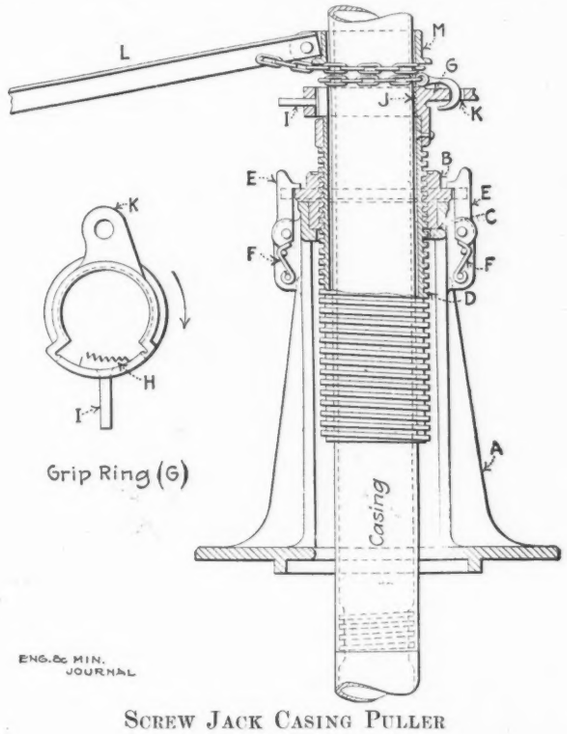
At the Calumet & Hecla smelting works the foundation for a new electrolytic building, 155x210 ft. has been finished, and contracts for the steelwork and part of the equipment let. One of the new furnaces with mechanical pouring devices went into commission in February, 1913. No construction has been required at the Buffalo plant.

On May, 1912, the wages of employees in all departments were raised 10%. The company elected to operate under the provisions of the Employers' Liability and Workmen's Compensation Act passed by the legislature last spring, and taking effect on Sept. 1. The rules of the Employees Aid Fund have been changed, discontinuing payments for accidents, and providing only for benefits in case of sickness. The company no longer subscribes to the fund, but in cases of death from sickness donate their fixed sum to the immediate family of the deceased. Expenditures of the aid fund during the year ended Dec. 31 amounted to $56,148, and the balance of assets was $159,714 on that date.

DETAILS OF PRACTICAL MINING

Ludlum Casing Puller

The drawing illustrates a device for extracting casings from drill holes, working on the principle of the screw jack, invented by Albert C. Ludlum, of New York, (U. S. pat. 1,037,179). The device comprises a jack standard *A*, in which the nut *B* freely rotates on the seat *C*. The nut engages the sleeve *D* by means of screw threads so that the sleeve must move up or down as it rotates in the nut. The latches *E* lock the nut in position when desired, being held in notches in the nut by means of the springs *F*. A grip ring *G* is secured to the upper portion of *D*. In one side of this is set the gripping piece *H*, which has vertical teeth and a handle *I* extending outward through a slot in *G*. The grip ring *G*, itself, has



SCREW JACK CASING PULLER

circumferential teeth shown at *J*. It is also provided with a perforated lug *K*. If *G* be turned on the casing in the direction shown by the arrow, it will bear against *I*, and will thus wedge *H* in the narrow portion of the recess in which it is set. By this means *H* will be made to grip the casing with its vertical teeth, at the same time forcing the horizontal teeth *J* into the casing. Thus the grip ring *G*, the gripping piece *H*, and the sleeve *D*, become in effect one piece with the casing, and if the rotation be continued, the casing will be pulled upward through the action of the sleeve *D* in its nut *B*.

Such rotation is effected by the lever *L*, pivoted to the collar *M* and pulling through a chain wrapped around the casing and hooked in the lug *K* as shown. The rotation and threading shown are such as will not unscrew right-hand threads on the casing joints. The fact that the casing turns, helps to loosen it in the ground. After raising the casing an amount equal to the travel of the sleeve *D*, the sleeve can be released by striking the lug *K* in a reverse direction to the arrow and the handle *I* in the direction of the arrow. The sleeve can then be run down in the nut and the operation repeated.

The device would seem capable of modification so as to serve for extracting stuck drills.

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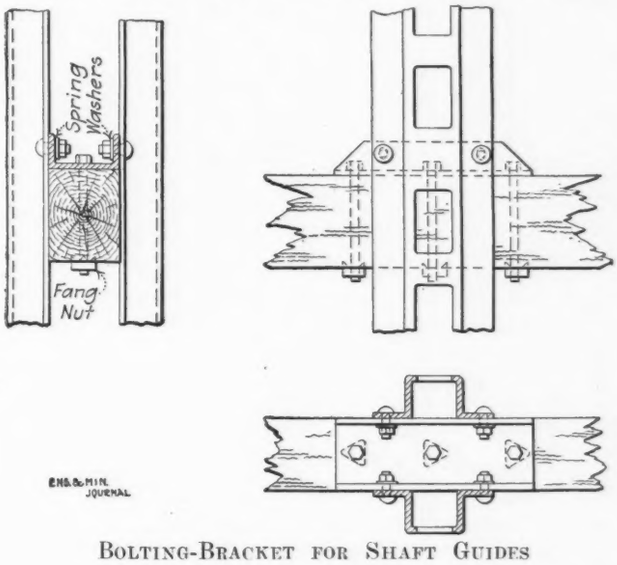
Method of Fastening Steel Guides

In the No. 5 shaft of the Crown Mines, Ltd., on the Witwatersrand, steel slotted guides are used. These were originally fixed by bolting direct through the wooden dividers, but it was found that the bolts rusted up solid, according to R. C. Warriner (Journ. South African Inst. of Eng., April, 1913), making the removal of a guide difficult. The method of fastening was therefore altered to that shown in the drawing. A short piece of channel was bolted to the top of the divider with the flanges flush



BOLTING-BRACKET FOR SHAFT GUIDES

with the vertical sides of the divider. Bolts ¾ in. in diameter, with a three-cornered fang nut were used, the nut being drawn into the bottom of the divider so that it could not work loose. The guides themselves were bolted to the flanges of the channel with ⅞-in. cup-headed, oval-necked bolts equipped with spring washers and nuts on the inner sides. In punching the guide flanges for this bolt, the holes were placed near enough to the flange edges to permit making the skip shoes deeper and taking advantage of the full wearing surface of the guides; this prolonged the life of the guides about 20%. A guide in any compartment can be removed without disturbing the corresponding guide in the adjoining compartment. The shoes of the skips and cages are lined with brass to reduce to a minimum the wear on the guides.

Electrical Cable Suspension in Shafts

The suspension of an electrical cable in a mine shaft may be effected by a single device at the top, or by fastenings at various points in the shaft length. The first of these, called single suspension, is frequently of the cone type. In this method, says E. Kilburn Scott, in a paper read before the Association of Mining Electrical Engineers of England, Feb. 7, 1913, a cone is slipped over the cable and the armoring wires bent back over the outside of the cone, so as to grip it firmly. Single suspension is available only for moderate depths, where the weight is small. The armoring also is likely to corrode and break. Its advantages are that there is nothing for a falling object to strike against, that there are no places for lodgment of dust and slime, and that installation is quick and easy. Another form of single suspension consists of a steel plate grooved down the center, to which the cable is held by a number of steel clamping pieces. Split bushings are fitted around the cable where it is gripped by the clamps, so that a succession of grips is obtained without the cable being squeezed out of the circular shape. The device is suspended by chains at the top of the shaft.

Suspension may also be obtained by the use of two wire ropes clipped to the cable and hung permanently in the shaft, with anchorages at intervals to supplement the top fastenings. This method is flexible and offers little opportunity for the lodgment of dirt, but in hot shafts the steel rope is more sensitive to temperature variations than the cable.

The most common method of cable suspension in England is by the use of cleats. The usual form of cleat is about three feet long, 12 in. wide and 6 in. thick, with a hole of the exact cable size bored through it lengthwise. The block is sawed in half and the 1/8 in. taken out by the saw is sufficient to give the necessary grip on the cable. Two two sides of the cleat are held together by bolts. Elm and pitch pine are woods frequently used. The pine resin assists the grip of the cleat. The tannic acid in oak renders that wood unavailable. Cleats may affect the insulation detrimentally by compressing it, and where the cable leaves the cleat there is a liability to injury of the insulation by vibration. An armored cable held by cleats is almost a solid bar, and great injury may be done by objects falling and striking the cable. But if the cleats are held by chains to the shaft sets this difficulty is somewhat avoided, as a certain flexibility is obtained. Cleats made of iron which press the cable directly against the shaft timbers, are also used. Since these cannot be longer than the width of the timber to which they are bolted, it follows that they must be more tightly bolted and bring more pressure upon the installation, or else they must be more numerous.

A Wasted Byproduct

Precipitation of copper out of "acid" mine waters at most large copper mines has reached a high state of development. It is remarkable that it is not more general at small mines and development properties. It is safe to say that every copper property could make a profit by sending its mine water over scrap iron. The cost of installing and operating a home-made precipitation plant is almost nothing. The empty cans from the boarding house are a nuisance and an offense. They can serve no better purpose than to precipitate copper. If precipitation boxes are installed underground, a large amount of corrosion can be transferred from the pumps and pipes to the cans. But whether underground or on the surface, one precaution should be observed. The precipitating iron should be always covered with water, thus reducing the amount of oxidation and giving a cleaner, higher-grade copper precipitate.

Highway Bridge of Round Timber

In constructing some small bridges in Yakima County, Wash., where a 40-mile haul made materials expensive, the State Highway Commission decided to use hewed timber for the wooden members, this being obtainable from adjacent forests. A contract was let for one 40-ft.,

A 60-Ft. Span Pole-Truss Bridge, Yakima County, Wash.

three 60-ft. and one 75-ft. span. Standard specifications for sawed-timber bridges were used, the same section of hewed timber being required, and the specifications covering quality and defects being the same.

The bridges, according to C. R. Ege in *Engineering News,* Apr. 24, 1913, were designed for a uniform load of 80 lb. per sq.ft. of floor surface, and the working stresses for timber, in lb. per sq.in., were taken as follows: Tension with the grain, 1200; compression in end bearing, 1400; in columns under 15 diameters, 1000; across the grain, 350; transverse fiber stress, 1200; shearing with the grain, 150; across the grain, 1250.

The 40-ft. span was carried by two king-post or A-trusses, made of sticks equal in size to 12x12-in. timbers. The bottom chords were single sticks. A 12x14-in. floor-beam at the center of the span was carried by two 1-in. round rods in each truss, which took bearing on a 1/2x6x12-in. plate at the apex of the truss. The floor-

beam was extended 5 ft. beyond the trusses and carried braces from its extremities to the apexes of the trusses to support them laterally.

The 60-ft. spans were three-panel queen-post trusses, similar in design to the 40-ft. span, except for counter-braces in the center panel. The accompanying photograph shows some of the construction features. The bottom chords were single sticks 68 ft. over all. These were cut and dragged into place by teams so as to span the river between the abutments, and the light staging to carry the upper chords during erection was carried by these sticks.

No castings were used at the joints in either the 40- or 60-ft. spans. The timbers were cut to bear on each other evenly and make an exact joint, the line of the joint bisecting the angle between adjacent members. The end posts transferred the thrust to the lower chords through scarf-joints, reinforced by thrust-blocks bolted to the lower chord over the end bearings.

The 75-ft. span was a five-panel Pratt truss, with steel eyebars for the lower chords, and rigid upper and lower lateral bracing. Standard Howe-truss castings were used at the joints. The timbers were cut to exact length, peeled and left round except at the joints where they were adzed to exact dimensions to fit the castings. Falsework staging was anchored to each abutment and built out into the river far enough to carry one panel, reducing the span for erection to about 40 ft.

The bridges had 14-ft. roadways, with 4-in. hewed plank floors, and railings of light smooth poles spiked to the end posts and verticals. The floor stringers were peeled logs, flattened on two sides to a minimum thickness of 12 in. Four such stringers carried the roadway. The abutments were rock-filled log cribs.

The contractor sublet the work of getting the timber out of the forests at 6c. per lin.ft., for sticks peeled only; and at 8c. per lin.ft. for sticks peeled and hewed.

A skilled workman can fell, peel and hew about 90 lin.ft. of timber per day of eight hours. The workmen were paid 5c. per lin.ft. for felling, peeling and hewing. Laborers and carpenters on the framing and erection received $3 and $3.50 per day; teams and drivers cost $7 per day; the foreman received $6 per day. The price paid for freighting materials from the railroad at Natches was $0.56 per ton-mile.

The contract was let at the following prices. Timber in place, $60 per M ft., b.m.; steel, wrought-iron and spikes, in place, 9c. per lb.; rock filling for log-crib abutments, $1.60 per cu.yd. The 40-ft. span consumed 7900 ft. b.m. of timber and 290 lb. of metal and cost altogether $500.10. A 60-ft. span contained 12,360 ft. b.m. of timber, and 780 lb. of metal, and cost $811.80. The 75-ft. span contained 13,700 ft. b.m. of timber and 5540 lb. of metal, $1320.60 being its total cost.

Considerations in Deep Sinking by Freezing Method

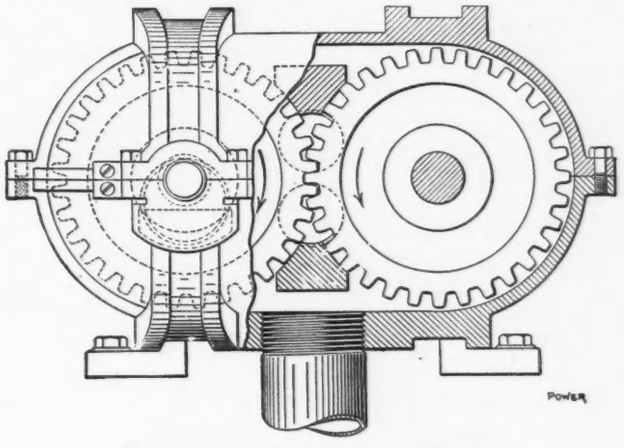
The results obtained in modern freezing methods of shaft sinking and the physical facts obtained therefrom can be briefly summarized (*Sci. & Art of Min.*, May 24, 1913), as follows:

(1) The compressive strength of frozen ice is increased by the admixture of sand and clay particles; hence the old theory that the limit of shaft sinking by freezing would be reached at a depth limited by the physical characteristics of ice is considerably modified. Undoubtedly, however, depths will be reached at which sinking by freezing will be inadmissible.

(2) A noticeable factor is the great difficulty experienced in driving bore holes vertical at a great depth, demanding increased care in the surveying of them as well as improved types of instruments for such purpose. (3) Much greater cold-producing capacity of the freezing plant is required. (4) Great care has to be exercised in the use of concrete during the process of lining shafts. (5) Character and quantity of salts in solution in the water-bearing measures required to be frozen demand increasing notice. (6) A guaranteed purity of freezing mixtures used, i.e., calcium or magnesium-chloride solutions, has to be assured. (7) Increased mechanical improvements in the fall tubes, pipes and joints must have due attention. (8) Finally, freezing in stages is only used as a last resort, as the introduction of this method leads to a reduction in the finished diameter of the shaft, besides consuming extra time in sinking.

The Clark Gear Engine

A new type of engine of simple construction has been designed by Charles H. Clark, of New York. In its simplest form it consists of two intermeshing gears and two tapering blocks having curved faces close to, but not



HALF SECTION THROUGH ENGINE

touching the teeth. One block is located above and the other below the intermeshing point, as indicated in the accompanying drawing. The blocks cover only small arcs of the gears and the larger parts of the gears are free to revolve in the casing. End plates between the blocks inclose the working section, says *Power*, Apr. 15, 1913.

Depending upon which direction it is desired to run the engine, steam is admitted above or below the center line of the gears and pushing against the teeth at full pressure causes rotation. As the teeth pass the apex of the block small volumes of steam are inclosed and carried as far as its base, where exhaust to the casing and then to atmosphere takes places.

It is the wedge-shaped blocks which distinguish the present design from other types of rotary engine. Unbalanced pressure, due to high steam pressure over a large area of the gears and exhaust pressure on the other side, has been the bugbear of inventors. It must be borne by the shaft and tends to cause excessive friction and

wear. In the Clark engine the small area exposed to unbalanced initial pressure of the steam practically eliminates this trouble.

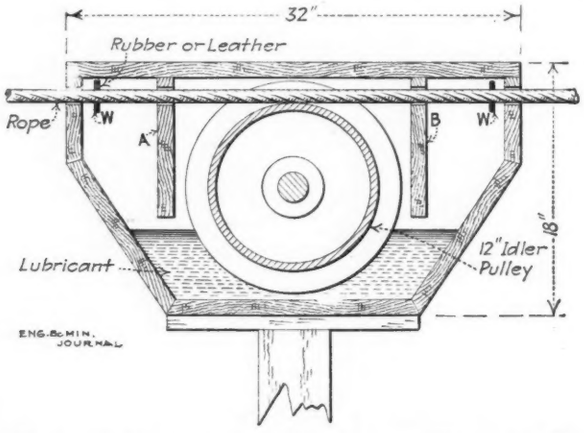
In the single-stage unit it is evident that the expansion of the steam is not utilized. To get the benefit of expansion it is planned to compound the engine, using several pairs of gears and exhausting from one to the other, the working volume increasing with a corresponding drop in pressure in each stage. As the number of stages increases, the economy is bettered. Basing his conclusions on results obtained from the simple engine, Prof. H. L. Parr, of Columbia University, estimates that a four-stage machine working between 100 lb. and atmosphere may be expected to develop a brake horsepower-hour on 30 lb. of steam.

A single-stage engine, rated at 35 b.hp. and in test developing 50, has been built and has been subjected to a number of tests, some at Columbia University and others at the New York Central power house in Yonkers. The best water rate obtained was 44 lb. per b.hp.-hr., when developing 46 b.hp. with an admission pressure of 97.5 lb. gage. With lower pressure the rate increased and at 10 lb. gage 94.2 lb. of steam per brake horsepower-hour were used. For intermediate pressures the rates varied between these limits. The floor space occupied by the engine was 2 ft. 11 in. by 2 ft. 1½ in., which equals 6.3 sq.ft., or 0.18 sq.ft. per horsepower of rating. The total weight of the engine was 620 lb. complete.

Lubricating Device for Hoisting Rope

By R. B. Wallace*

An apparatus applicable to lubricating a hoisting rope which is horizontal or nearly so in some portion of its course, is illustrated herewith in longitudinal section.



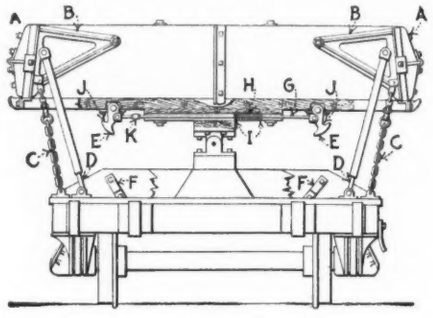
A Box for Lubricating Horizontal Hoisting Rope

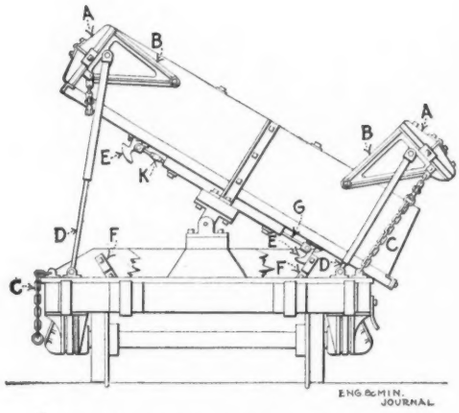
It consists of a wooden or metal box which has a removable cover and is bored so that the rope can pass through. It is 7½x18x32 in. as shown. The lubricant is contained in the bottom of the box and is picked up on a wheel and carried to the rope, the wheel being actuated by the rope running over its top. The wheel is a cast-iron idler sheave running free on a 2-in. shaft, which is held in holes in the box sides by cotter pins. There are two rubber or leather washers *W*, partially free, which serve to clean the rope of excess oil.

*Mining engineer, Republic Iron Co., Republic, Mich.

Karhu Side-Dump Car

The drawings illustrate a side-dumping car with automatically operated side doors and an automatic latch to hold it in dumping position. The car was devised by John Karhu of Calumet, Mich. (U. S. Patent 1,046,602). The general method of operation is evident from the end views given. The side doors *A* are hinged at their ends to the car body by the pieces *B*. In normal position the car body is held horizontal and the doors held closed by the chains *C*. These chains are in two pieces, connected by a hook with a safety link protecting its end. To dump the car, the chain hooks on one side are released, and that side elevated. The telescoping rods *D* are drawn out on that side and the corresponding rods on the other side are shortened slightly till they reach the end of their telescoping travel. They are then in effect solid, and as that side of the body is depressed, the hinged pieces *B*, which are pivoted to the ends of the telescoping rods, are swung upward so as to lift the door from the body and permit the discharge of the contents.





New Side-Dump Car

The latch *E* in this position catches under the keeper *F*. These latches on the two sides are connected by a rod *G*. On this rod the spring *H* is held between the washers *I*, which are held in a recess in the timber as shown. The spring thus opposes movement of the rod in either direction. As the lowered latch *E* comes in contact with the keeper it is snapped back by the spring so as to catch the keeper in the hooked portion *J*. To release the engaged latch, the latch at the upper end is pulled by the operator. By means of the turn-buckle *K*, the length of the rod *G* is adjustable.

DETAILS OF METALLURGICAL PRACTICE

Annealing Graphite Crucibles

The fact that graphite crucibles should be carefully annealed before putting them into a hot furnace is often overlooked or not thoroughly understood by operators. It is true, however, that these crucibles are hygroscopic and are likely to carry a considerable percentage of moisture. As they are made under high pressure the contained moisture cannot be driven off rapidly, and if sudden heat is applied, an explosion will result and the crucible will be ruined. This phenomenon is too frequently seen about the melting rooms of metallurgical plants where graphite crucibles are used, and results in an expense too great to be disregarded.

On arrival at the plants where they are to be used, these crucibles contain, as a rule, 4 to 5% water. To get rid of this is a necessity, and it must be done slowly. Keeping the crucible stock in the dry heat of the melting room reduces the moisture slowly so that by heating it for a few hours on top of the furnace before using it is generally sufficient treatment. A new crucible should never be placed in an old, hot fire unless absolutely sure that it is perfectly dry.

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Electrolytic Refining of Silver Bismuth Alloys

According to W. N. Lacey ("Trans. Am. Electro-Chem. Soc.," 1912, p. 301), laboratory experiments showed that the best results were obtained with an electrolyte prepared by adding a 5% solution of potassium cyanide to a 5% solution of silver nitrate till the precipitate produced re-dissolved. A deposit containing less than 1% of bismuth may be obtained with a current density of about 0.14 amp. per sq.dm. The current density gradually decreases during electrolysis, and the potential difference between the electrodes gradually increases slightly, but it may safely be as high as 6 volts. The power required is about 0.25 kw.-hr. per lb. of silver at 1.5 volts, and increases by 0.11 kw.-hr. per volt increase in the resistance. The deposit is quite adherent and the use of anode bags is not necessary.

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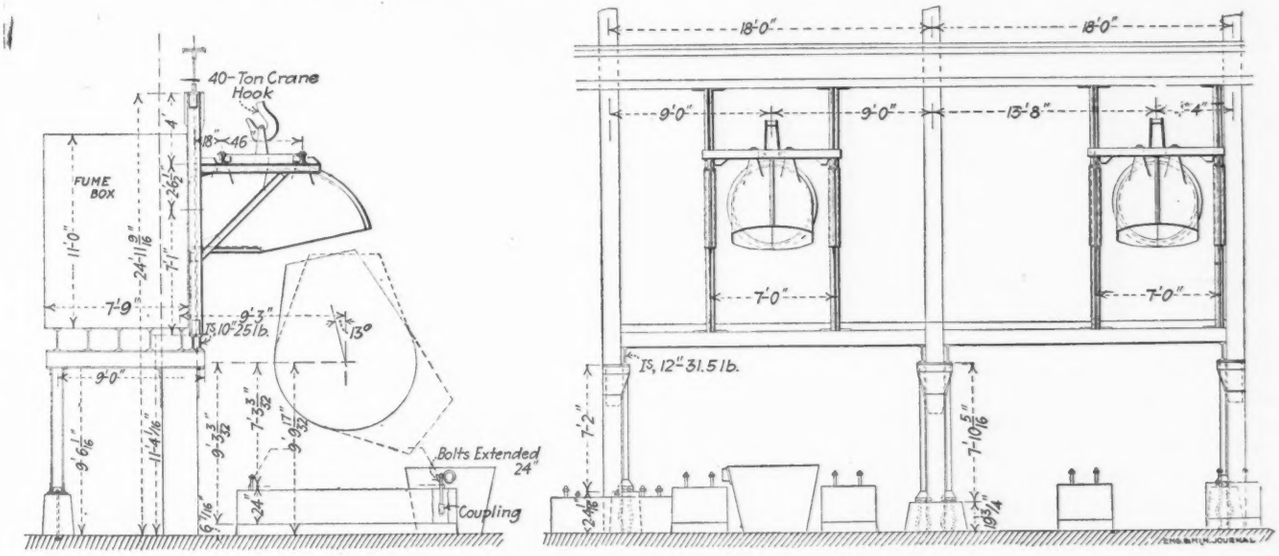
The Brower Converter Hood

By Richard H. Vail

The converter hood designed by C. L. Brower, of Chrome, N. J., was briefly referred to in the article on the "Copper Smeltery of the U. S. Metals Refining Co." in the Journal of May 24, 1913. A photograph of the hood in operating position was shown in the original article, but the construction will be more readily understood from the accompanying detail drawings.



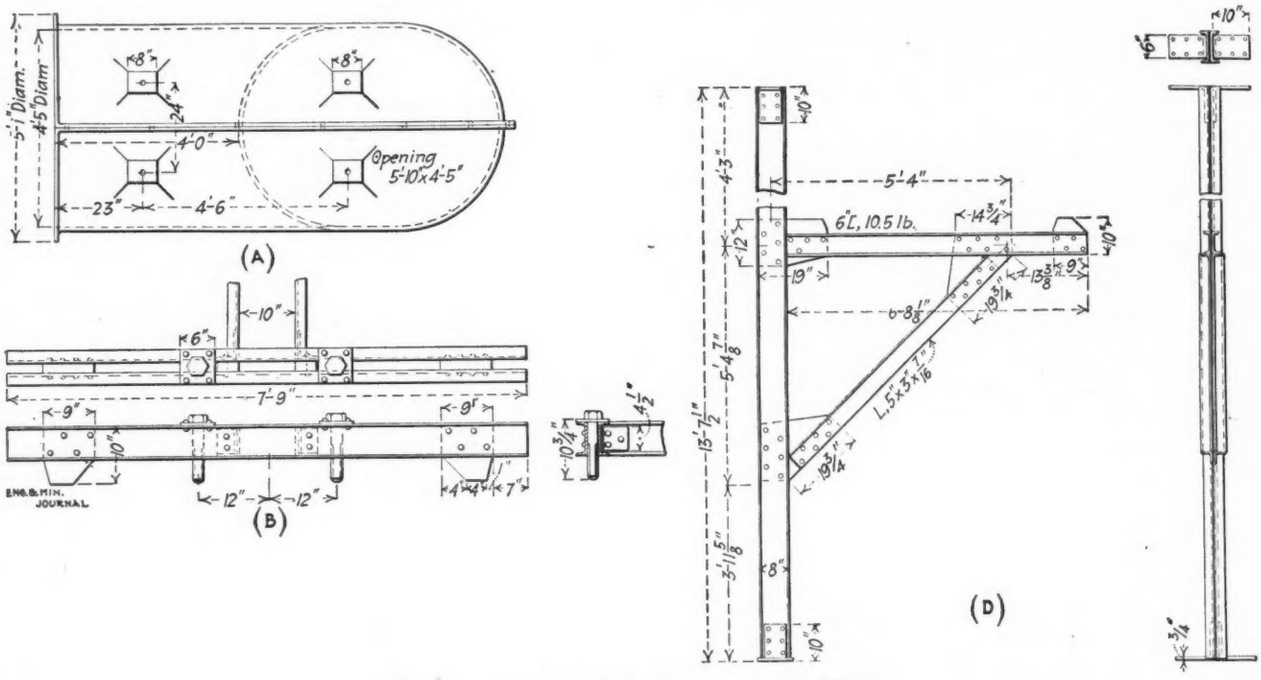
Brower Convertor Hood, General View

The hood proper is simply two steel castings bolted together, to which is attached the suspending frame. The latter is built up mainly of 6-in. channels arranged both to rest on the knee-brace supports of the building columns, and to provide for suspension of the crane. When it is desired to clean the hood, the crane merely lifts it off the knee-brace supports and places it on the ground where it can be cleaned easily and completely when occasion permits. This is in marked contrast with the half-hearted cleanings that converter hoods usually receive, while a shell is being changed or is temporarily turned down.

A spare hood of the Brower type can be placed in position in about the time the men would consume in getting started at cleaning a hood of the old type. The

Brower hood when in position has no permanent connection with the dust box; the flanges of the hood simply abut on the front wall of the dust chamber where is cut a hole corresponding with the internal diameter of the hood.

The circular section of the Brower hood would seem to be better adapted to carrying away the gases from the converter mouth than the common hood of rectangular section, and has the further advantage of being more nearly over the mouth of the converter so that it seems to receive and direct the gas stream without seriously reducing the velocity or permitting the "backwash" so common with hoods of rectangular cross section. In this respect, it is similar to the movable hood designed by James Doull[1] for the Butte Reduction Works, but the Brower hood has the advantage of being more simple in construction and of being removable to the ground for cleaning. The converter room at Chrome is exceptionally free from smoke leakage either at the hood mouth or at the junction with the dust box.



DETAILS OF THE BROWER CONVERTER HOOD

Black Sand Recovery in Rand Milling

Black sand as known on the Rand mainly consists of iron sulphide containing a large quantity of gold, small quantities of iridium, osmiridium, and in some cases platinum, and other metals of the same group ("Journ. Chem. Met. and Min. Soc. of So. Afr.," 1913, p. 418). Owing to its friable nature, the black sand is largely reduced to fine particles during crushing and in the mortar boxes, and tends to be floated over the amalgamated plates. To overcome this tendency the author uses a floating apron of strips of thin cork sheet extending across the plate about halfway down. The recovery of the black sand in this way is dependent on the mill being run with alkaline water. Figures are given showing the advantage of recovering the black sand and treating it separately, as against allowing it to go forward with the pulp for cyanide treatment.

[1]"Eng. and Mining Journ.," Feb. 26, 1913.

Weights and Volumes of Cement

The accompanying table of weights and volumes, based upon averages of a large number of tests by the authors and other experimenters, is given by Taylor & Thompson in their book "Concrete Costs." The net weights of cement per barrel are the standards recommended by the American Society for Testing Materials.

Formerly, the net weight per barrel of portland cement was 380 lb., of Eastern natural cement, 300 lb., and of Western natural cement, 265 pounds.

MEASUREMENTS AND WEIGHTS OF CEMENT, MORTAR AND CONCRETE

Portland cement weighs per barrel, net	376 lb.
Portland cement weighs per bag, net	94 lb.
Natural cement weighs per barrel, net	282 lb.
Natural cement weighs per bag, net	94 lb.
Cement barrel weighs from 15 to 30 lb., averaging about	20 lb.
Portland cement is assumed in standard proportions to weigh per cubic foot	100 lb.
Packed portland cement, as in barrels, averages per cubic foot about	115 lb.
Packed portland cement based on a barrel holding 3.5 cu.ft., weighs per cubic foot	108½ lb.
Loose portland cement averages per cubic foot about	92 lb.
Volume of cement barrel, if cement is assumed to weigh 100 lb. per cubic foot	3.8 cu.ft.
American portland cement barrel averages between heads about	3.5 cu.ft.
Foreign portland cement barrel averages between heads about	3.25 cu.ft.
Natural cement barrel averages between heads about	3.75 cu.ft.
Weight of paste of neat portland cement averages per cubic foot about	137 lb.
Volume of paste made from 100 lb. of neat portland cement averages about	0.86 cu.ft.
Volume of paste made from one barrel of neat portland cement averages about	3.2 cu.ft.
Weight of portland cement mortar in proportions 1 : 2½ averages per cubic foot	135 lb.

Weight of concrete and mortar varies with the proportions as well as with the materials of which it is composed.

Weight of portland cement concrete per cubic foot after setting:

Cinder concrete average	112 lb.
Conglomerate concrete average	150 lb.
Gravel concrete average	150 lb.
Limestone concrete averages	148 lb.
Sandstone concrete average	143 lb.
Trap concrete average	155 lb.

Loose unrammed concrete is 5% to 25% lighter than concrete in place, varying with the consistency.

NOTES FROM CURRENT LITERATURE

Manganese Deposits at New Ross, Nova Scotia

An occurrence of manganese at New Ross, N. S., is described by H. E. Kramm, in the *Transactions* of the Canadian Mining Institute for 1912. Two fissure veins there occur in granite, having a strike of about N 50° E, and dipping 70° to 90°, with widths up to 70 in. as a maximum. These vein deposits may be divided into four zones. The upper or first zone is a gossan of hematite, limonite and goethite. In the second zone, pyrolusite predominates, with some manganite. The transition between these two zones is gradual. Crystals of pyrolusite, pseudomorphous after manganite, are particularly common here. In the third zone, the pyrolusite decreases in amount and the ore becomes more massive, harder and of a steel-blue color, being made up of manganite and psilomelane. The fourth zone consists of a hard, bluish-brown ore, principally composed of a mixture of psilomelane, iron oxide and some manganite. Pyrolusite is here entirely absent. It has been suggested by Penrose that the deposits were formed by the breaking down of manganiferous minerals in the crystalline Paleozoic rock, and igneous rock. Biotite and orthoclase in the granite might readily be the sources of the manganese. Manganese and iron being about equally soluble in water, are taken into solution by meteoric waters, which would precipitate oxides or carbonates of manganese and iron when exposed to the atmosphere. Probably the fourth zone mentioned represents the original deposition, consisting of psilomelane and of limonite deposited as a homogeneous mixture. Pseudomorphs after carbonates suggest that deposition as carbonates also took place. Siderite and rhodochrosite may have been thus laid down and later broken down into oxides. This, however, would leave a more porous ore than that which is found, and the escape of great quantities of CO_2 would surely leave more traces in the upper zones. Secondary changes produced the present conditions. The iron capping devoid of manganese shows the greater solubility of the latter mineral. Solution, deposition and oxidization formed successively toward the surface, manganite and pyrolusite. Even the purest pyrolusite obtainable showed appreciable quantities of BaO, a constituent oxide of psilomelane.

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Spacing of Multiple-Triangular Notch Weirs

The V-notch weir was recommended long ago for use in measurement of water flow, as embodying many convenient principles. The typical form involves a notch making a 90° angle at its lower extremity. In the case of heavy flows, it is often impossible to obtain sufficient drop to install a notch with this angle. For such cases there has been suggested a notch with a wider angle, such as 130°. It is found, however, that a 130° notch is unsatisfactory, since a vacuum is alternately formed and broken on the downstream side of the weir boards, preventing a smooth flow and vitiating the results. An alternative is a series of 90° notches, spaced evenly across the weir board. In such cases the question of spacing is an important one, as the flows into the notches must not create mutual disturbances. Discussing this question, H. S. Rowell (*Engineering*, May 2, 1913) states that by applying the results of experiments on a single-notch weir, it is found theoretically that for complete immunity from interference the notches of a multiple-notch weir should be at least seven times the head apart. However, if the notches are only 3½ times the head apart, the difference in results from the standard single-notch weir would not exceed 0.5%, which is sufficiently accurate for practical purposes.

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Bulgarian Mineral Deposits

While Bulgaria is principally an agricultural country, coal and metal deposits are known, and some work has been carried on. Some notes on the principal deposits are given by Herbert K. Scott (*Bull.* 103, I. M. M.). The mining law modified in 1910 and now in use is extremely generous and drawn up in a broad spirit in order to attract investors. It provides for prospecting and exploring concessions, and fixes a certain acreage tax and a percentage tax on gross products.

Deposits of lignite and bituminous coal, and some rather poor anthracite are known. Manganese is found in certain places. At the Bela property, about 7½ miles south of the port of Varna, manganese occurs as wad in thin lenses in clay. The ore is friable, contains a large quantity of moisture and combined water, and is not of remarkably high grade. The Dobra Nadejda property is about two miles from the station of Jambouli. The ore occurs as pyrolusite in a bed varying from 1 to 4 ft. in thickness at a contact of andesite as the foot wall, and limestone as the hanging wall. This ore is also low grade; the deposit is narrow, and is unlikely to continue in depth.

The Blagovest magnetic iron-ore property lies 15 miles to the south of Jambouli. The iron occurs as lenticular masses in diorite and is probably the result of magmatic segregation. Considerable exploration work has been done, but no depth attained. Analyses show that the ore could be shipped containing more than 60% of iron, with low phosphorus and silica.

The Plakalnitza copper property is situated about five miles from the station of Elisena, on the Sofia-Vratza line. The ore consists of bornite, tetrahedrite, malachite and chalcopyrite, in three lenticular-shaped masses, with a thickness ranging from 3 ft. to 10 or more. The country rock is limestone. In 1910, a depth of 220 ft. had been obtained, and the ore opened for 350 ft. along the strike. The output in 1910 was 60 tons per day of ore running between 5 and 7% of copper. The ore was

conveyed to the smeltery by a 7-mile aërial tram, crushed, sorted and smelted to 55% matte in two stages, using British coke. A concentrating plant has subsequently been installed, particularly for separating the galena, which increases with depth.

The Sedmolchislenzia mixed sulphide property lies about 6½ miles southwest of Vratza. The orebodies are mineralized lenses, following the stratification planes of the dolomitic limestone, and are from 2 to 7 ft. in thickness. Blende, calamine and galena are found, the blende predominating as an economic mineral. Some silver is present, and copper is said to have been found in certain portions. Mineral of economic value probably occurs here, and further development would be justifiable.

The Kara Bair or Economoff copper and lead property is situated about 10 miles southwest of the port of Burgas. Several veins running from 1 to 6 ft. in thickness here occur in an andesite and carry bornite, chalcopyrite, galena, blende and pyrite in a siliceous gangue.

Separation of Niobium and Tantalum

Potassium-tantalum fluoride is precipitated almost quantitatively from solution in aqueous hydrogen fluoride, on addition of potassium chloride, one reprecipitation being sufficient to render the precipitate free from niobium, and the following method of analysis, based on these facts, is given by E. Meinberg and T. Winzer in *Zeit. f. angew. Chem.*, 1913, 26 (Journ. Soc. Chem. Ind., Apr. 15, 1913).

Thirty grams of ore are decomposed by means of potassium bisulphate, an aliquot portion of the purified acid (5 to 10 grams) is dissolved in hydrofluoric acid, sufficient for the formation of double potassium fluoride, and the solution mixed with a saturated solution of potassium chloride and allowed to cool, the total volume being so adjusted that the potassium-niobium fluoride may remain in solution, its solubility being 1 in 12. The precipitated potassium-tantalum fluoride is washed in a solution of potassium chloride and then converted into tantalic acid by evaporation with sulphuric acid, and again precipitated from hydrofluoric-acid solution with potassium chloride, or, the double fluoride is dissolved in water containing hydrogen fluoride, potassium chloride is added, and the mixture allowed to cool completely. By heating with sulphuric acid, the double fluoride precipitate is converted into tantalic acid, and the residue boiled with water containing hydrochloric acid, and with ammonia, and weighed as the oxide, Ta_2O_5, its freedom from niobium being finally tested colorimetrically. Niobic acid is determined in the solution. The method is said to be well suited for the preparation of tantalic acid on a commercial scale, for which purpose, finely powdered columbite or tantalite is treated in a rubber-lined vessel with about an equal quantity of crude concentrated hydrofluoric acid, while stirring and introducing steam at 3 to 4 atmospheres pressure. The clear solution is precipitated with the necessary quantity of the saturated solution of potassium chloride, and the double fluoride. after conversion into acid and purification, is again precipitated with potassium chloride, from hydrofluoric-acid solution.

The product, containing very little niobium, can be obtained quite free from this element by recrystallization, from water containing hydrofluoric and hydrochloric acids. Experiments with oxalic acid and hydrochloric acid have shown that niobic acid is much less soluble when tantalic acid is present, and the lower oxides of niobium obtained by reducing niobic acid with the zinc and hydrochloric acid, although readily soluble in hydrochloric acid, are insoluble in the presence of tantalic acid.

Nature of the Occurrence of Titanium in Magnetites

With a view to utilizing existing magnetite deposits high in titanium, attempts have been made to eliminate the excess titanium by means of magnetic processes, since magnetite is highly magnetic, while ilmenite is but slightly so. The results of these experiments have been contradictory, although it has been found that finer crushing up to a certain point usually results in a better separation. It is found that titaniferous magnetite to a certain but varying extent consists of granular aggregates of magnetite and ilmenite, but that the magnetite grains in such aggregates also contain a varying amount of titanium. To investigate the matter the metallographic microscope has been brought into service and the results from its use are described by Joseph T. Singewald, Jr., in *Econ. Geol.*, April-May, 1913. To contrast the two minerals in the polished section, they were etched with hydrochloric acid; the magnetite is soluble and assumes a dull black appearance, while the ilmenite is not, and remains bright. It was found in most cases that the aggregates resembled a granular igneous rock, with a texture varying from coarse to fine. However, the magnetite grains are not homogeneous but contain minute intergrowths of ilmenite, appearing in the sections as lines and dots. The lines are sections of minute lamellae oriented parallel to the octahedral faces of the magnetite. The dots are sections of particles and tend to congregate near the contacts of the magnetite grain with adjoining ilmenite grains. These intergrowths are too minute to permit of their mechanical separation from the magnetite; and being abundant enough to give a considerable titanium content, they account, to a large extent, for the failure of magnetic separation to eliminate the titanium from ores. However, certain grains of magnetite showing no titanium inclusions under the microscope were analyzed for titanium and found to contain about 6 or 7%. The conclusion is that titanium occurs as a part of the magnetite molecule and apparently a titano-magnetite mineral exists.

Estimation of Arsenic in Pyrites

A communication from the Materialprüfungsamt Lichterfelde to the *Chemiker Zeitung*, treats of the estimation of arsenic in pyrites,[1] stating that some of the methods in ordinary use gave results from 40 to 80% below the truth. Fine grinding is considered essential and treatment with chromic acid and dilute sulphuric acid is recommended for effecting oxidation and solution.

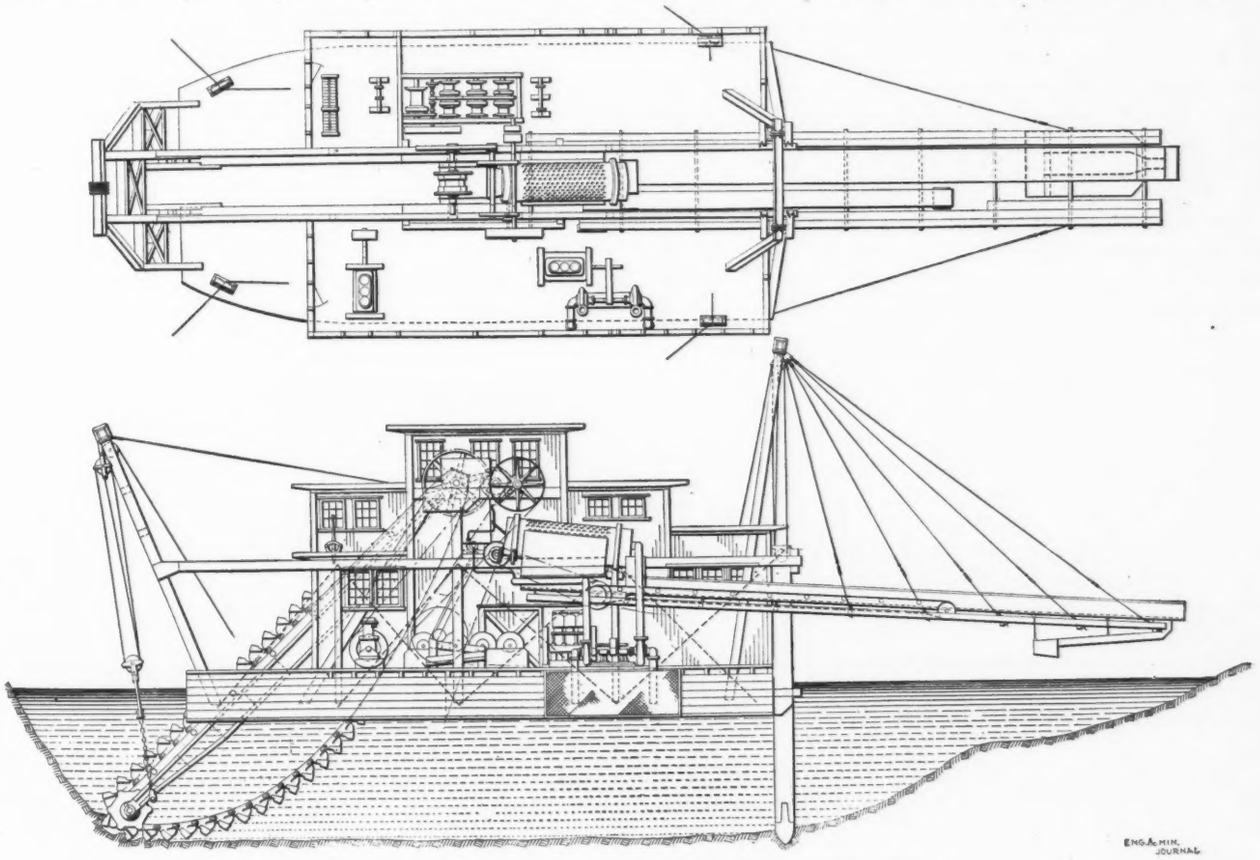
[1]Abstr., "Chem. Tr. Journ.," Feb. 15, 1913.

New Gold Dredges for Alaska

By Lewis H. Eddy

SYNOPSIS—A description of three California-type dredges now being prepared for use in the Alaskan field. All are operated by internal-combustion engines, using distillate as fuel. The combination screen and flume type, built for the Kotzebue Gold Dredging Co. to work on the Inmachuck River, is the first of its type in Alaska.

Three new California-type bucket-elevator gold dredges built by the Union Construction Co., of San Francisco, will be installed in Alaska in the season of 1913. The designs have been completed and the machinery and material will be ready for shipment by the earliest steamers.



First Revolving Screen and Flume Dredge in Alaska

Two of these dredges will be equipped with 3-cu.ft. close-connected buckets, one with 2¾-cu.ft. open-link buckets. All will be gasoline driven, using California distillate. One of the 3-cu.ft. boats will be provided with combination screen and flume for washing and disposing of the gravel, the others with flume only.

The combination screen and flume type of dredge for digging in gold placers is a new departure in Alaska. The performance of this dredge will be watched with interest by operators in clayey fields similar to that for which this one is especially designed. The hull will be built of wood, 62 ft. 6 in. long, 30 ft. wide, 5 ft. 6 in. deep. The revolving screen is 13 ft. 6 in. long, 4 ft. diameter, 2½-in. perforations. The conveyor belt is 24 in. wide, and 37 ft. long between centers, to be placed at the port side of the screen. The flume, which will be placed at the starboard side of the screen, will be 75 ft. long, 42 in. wide and have an undercurrent, or return, flume 11 ft. long, 7 ft. wide. The conveyor belt will be placed at the same incline, or grade, as the flume, which has a normal drop of 10 in. in 12 ft. The combined construction of flume and conveyor-belt stacker is designed to be adjusted to any desired incline, working on a shaft at the stern end of the boat.

Only the coarse gravel will be carried by the conveyor belt. The heavy clay passes to the flume after being well broken in the revolving screen, and by the time it travels the 75-ft. length of flume it should be wholly disintegrated. This method of washing and conveying will handle more thoroughly and economically the stiff and tenacious clays that are mixed with the gravel deposits than can be done by the revolving screen alone on boats of small bucket capacity. The large boats, of 9 to 15-cu.ft. bucket capacity have no difficulty in handling similar clay deposits, without flume attachment; but the small dredge is an economic necessity in most of the Alaska fields owing to shallow ground and the distance and difficulty of transporting the machinery and structural material of which the dredges are built.

Another economic advantage of the combined screen and flume type over the screen dredge without flume attachment is in the downward incline of the conveyor-

belt stacker instead of the upward incline. The life of the belt so placed is about twice that of the belt which elevates the tailing. The first cost of installation is less and the dredge of this type draws less water. It is doubtful if a dredge equipped with either flume or screen alone could handle the stiff clay in this gravel deposit, unless it were of large bucket capacity; and the ground is too shallow to permit economical operation of a large dredge.

The main drive, winch and screen will be moved by one 50-hp. gasoline engine. The feature of a winch for a gasoline-driven dredge is that it has two forward speeds and one reverse speed, so that it has practically the same operation as an electrically-driven winch. The dredge will be equipped with a 7-in. high-pressure pump and an 8-in. low-pressure pump, both on the same shaft and connected to a gasoline engine with a Reynolds silent chain. A 2½-in. centrifugal pump, driven from the main shaft, will be installed at the upper end of the revolving screen, carrying a stream upward and striking the concave of each bucket at an angle of about 85 deg. as the bucket dumps its load into the hopper and just after the main body of material drops out. The stream is intended to wash the bucket clean of clay by striking at a point in the bottom of the bucket and completing the travel at the lip. This pump does not take its suction out of the pond, but out of the main pipe of the supply pump. By this arrangement the pump stops when the bucket line stops, but it is always primed.

This dredge is being built for the Kotzebue Gold Dredging Co. to operate on Inmachuck River on the Arctic Ocean, and is the only gold placer dredge of the combined screen and flume type in Alaska. The tin placer dredge operated by the York Dredging Co., on Buck Creek, is of the same type, and has in the two seasons it has been in commission proved satisfactory.

The 3-cu.ft. dredge without screen, for which the machinery is being built, will be installed on Kugruk River about 16 miles from Inmachuck River and running parallel to it. This dredge will be operated by a company not yet incorporated, of which Iver Johnson is the head. It will be equipped with a 14-in. pump under low head for sluicing. The gravel in this field is small and is not associated with clay. It will pass readily through the flume.

The 2¾-cu.ft. dredge will be installed and operated by C. Flodin, of Chicago, and Gerrold H. Hattan, of San Francisco, Calif.

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Report of Alaska Mine Inspector

The report of the mine inspector for the territory of Alaska, covering 1912, contains a plea for more assistance in field and office. The size and inaccessibility of the territory to be covered, render it necessary to employ deputies if efficient inspection is desired. It is stated that in general labor was plentiful. Twelve fatal accidents occurred during the year, and while information as to their causes was difficult to obtain it appears that falls of ground, falls into openings, and explosive accidents as usual made up the greater part of the list.

It is stated that if the present mining law were enforced to the letter every mine in Alaska would be closed, and a revision of the territorial code is urged. Such a revision would include: (1) A competent employers' liability law; (2) penalties for employees for infraction of rules and breaches of dicipline; (3) extreme penalties for allowing inexperienced men to handle high explosives; (4) registration of mines with the inspector, periodical reports of operations, and special reports of accidents and deaths; (5) reports by all hospitals of deaths occurring therein brought on by accident or disease in mines; (6) certificates of competency for hoisting engineers, foremen and fire bosses, subject to revocation by the inspector.

The report concludes with notes on the mines visited and inspected during the year, and with tabular representations of the mineral production of the territory and the equipment and extent of the mines in operation.

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Joint Institute Meeting at Rossland

SPECIAL CORRESPONDENCE

Late in May there was held, at Rossland, B. C., a joint meeting of the Spokane Local Section of the American Institute of Mining Engineers and the Western Branch of the Canadian Mining Institute. Officers of the former present were: Prof. R. S. McCaffery, of the University of Idaho, Moscow, Idaho, chairman, and L. K. Armstrong, Spokane, Wash., secretary; of the latter, M. E. Purcell, of Rossland, B. C., chairman, and E. Jacobs, of Victoria, secretary. Two evening sessions were held, and M. E. Purcell presided. The attendance numbered about 50 the first evening and 70 the second; this included visitors as well as the members of both institutes. Papers were read in the following order on the first evening:

(1) "Notes on the History and Progress of Rossland Camp, together with a Synopsis of R. G. McConnell's Geology of the District," by E. Jacobs. (2) "The Use of Oxygen Helmets in Mine Fires," by E. P. Dudley. This was a statement of experience in fighting a fire last October in the Bunker Hill & Sullivan mine, Kellogg, Idaho. (3) "Ore-Handling and Sorting Arrangements at the Center Star Mine, Rossland, B. C.," by M. E. Purcell, superintendent. (4) "The Copper-Smelting Department of the Consolidated Mining & Smelting Co.'s Works at Trail, B. C.," by James Buchanan, superintendent. (5) "The Consolidated Mining & Smelting Co.'s Electrolytic Lead Refinery at Trail, B. C.," by J. F. Miller, superintendent.

On the second evening the following papers were presented: (1) "The Effect of Lime on the Solubility of Silver in Cyanide Solutions," by H. W. Foester, Nampa, Idaho. (2) "Mining and Metallurgy as Practiced in the Sudbury Nickel Fields, Ontario," by Charles J. Murphy, Fernie, Crow's Nest Pass, B. C. (3) "Notes on Metal-Mine Accidents and First-Aid to the Injured," by E. Jacobs, Victoria, B. C.

On each evening there were several addresses by prominent local residents. There was shown, too, a Draeger pulmotor, the use of which was demonstrated by Professor McCaffery; also, a locked dynamite-cap box, for mine use, patented by A. S. Hamilton, master mechanic for the Western Fuel Co., Nanaimo, B. C. An illustrated description of the latter device was published in *Coal Age* of Aug. 17, 1912.

The morning of one day was spent in visiting the Center Star group of mines, at which both underground workings and surface plant were seen; in the afternoon

a visit was paid to the Consolidated Mining & Smelting Co.'s lead- and copper-smelting works and electrolytic lead refinery at Trail.

At a business meeting of the Western Branch, C. M. I., the secretary's report and statement of accounts for the year to May 1, were submitted and adopted. The ballot for chairman of the branch for the ensuing year resulted in the election of W. J. Sutton, geologist, of Victoria. An invitation was received from the Spokane Local Section, A. I. M. E., for members of the C. M. I., to attend the fall meeting of the Local Section, to be held in Wallace, Idaho, next October; it was decided to ask as many C. M. I. members to attend as shall find it practicable to do so.

J. Howard Johnston

J. Howard Johnston, president of the Backus & Johnston Co., operating a smelting plant at Casapalca, Peru, one of the best known works in South America, died May 8, at Miraflores, near Lima, where he had gone for his health a day or two previously. Mr. Johnston was 62 years old; he was born in New Hampshire, and after serving for a short time in the closing year of the Civil War, he entered Dartmouth College, from which he graduated about 1868. In 1870, he left the United States and went to Peru, where he entered the service of Henry Meiggs, who at that time was engaged in constructing several railroads in that country. Mr. Johnston was employed on several of his lines, the last one being a high-grade road from Arequipa to Puno. About 1880, he left railroad work and associated himself with Jacob Backus, who had been superintendent of the Central Railroad, and established an ice-making plant in Lima, to which was later added a brewery. A few years later, this plant was sold to an English company and Messrs. Backus & Johnston invested their capital in the construction of smelting works at Casapalca. For some years this concern was run as a custom smeltery, treating ore for a number of mines which were then at work in Yauli, Morococha, and elsewhere, but later the company secured important holdings of its own, including what are now the best known mines in the republic.

In 1898, he left Peru for a visit to the United States and Europe, and lived in Italy for several years. The death of Mr. Backus and the depreciation of the smelting works brought him back to Peru in 1908, and he went vigorously to work rebuilding and remodeling the works until he made them once more the best known and most successful in the country. He engaged very actively in this work, and remained at Casapalca until a short time ago, when he realized that his health had been undermined by too long a residence in a high altitude, and he returned to Lima in the hope of recovery.

Mr. Johnston was a man of great energy and was not only one of the oldest, but also one of the most highly esteemed of the members of the American colony in Peru. The success of his mining operations was largely due to his individual exertions.

The Patras District (Greece) Imports Considerable Copper Sulphate, amounting to about $200,000 worth per annum. According to "Daily Consular and Trade Reports," May 19, 1913, it is brought from England in 5-cwt. casks (560 lb.), guaranteed 98 to 99% $CuSO_4$. 5 H_2O, and was delivered c.i.f. Patras at $112@115 per ton, cash against documents. The chief imports are made in the first three months of the year.

Metal Tariff and the Lobby

Considerable interest has been aroused by the fact that in the lobby inquiries before the special investigating committee in the Senate no information whatever has thus far been adduced to show the use of improper influence or even of any considerable activity on the part of persons or corporations representing or interested in metals and mining products. Senator Stevenson, of Wisconsin, confessed to ownership of an iron mine, and various others were more or less interested in the mining industry in different ways. Senator Root, for example, admitted his ownership of a moderate block of stock in American Smelters' Securities Co. and in the National Lead Co. Others were owners of limited amounts of property affected by the tariff on metals and minerals. As for lobbyists, it has not been shown that definite and accredited representatives of any important metal interests have been at work. In fact the comparative indifference that seems to have been exhibited of late by the iron and steel men has for some time been a matter of comment among those who have been following developments with care. They have been surprised that comparatively little activity was shown by United States Steel and other corporations, which have been supposed to be largely interested in the shaping of the tariff.

As now understood, it is considered probable that pig iron and ferromanganese will go to the free list as already reported in these columns. The Underwood rates on structural steel will also be lowered and some changes will be made in highly finished products. Taken all around, it is expected that the bill will show in the metal schedule, a decidedly lower average rate than that which has been figured out as the equivalent of the rates established in the schedule while it was in the House. Other changes tending to bring about a generally lower effective rate on the metals and their products are expected to be made by alterations that are contemplated in the customs administrative sections of the bill and probably also those that deal with smelting in bond. There is, therefore, no sign of change from the cuts in the tariff made by the Ways and Means Committee. On the other hand, it seems probable that those who have clamored for still further reductions on the products of lead, zinc and other metallic ores will be disappointed.

Western Electric Mine Telephone

In solving the problem of making a serviceable telephone for mines, the Western Electric Co., instead of attempting to keep moisture, gases, acids, etc., out of the sets, merely built them so that moisture and gases would not injure the various parts if they could get in. All apparatus is inclosed in a substantial cast-iron case, heavily japanned inside and outside and equipped with two doors. This combination makes the set fireproof, rustproof and moistureproof when closed. The iron case is also curved at the top so that water or any other foreign matter falling upon it will easily slip off. The line wires may be brought in either at the top or bottom of the case. When brought in at the top, the wires run in through a curved inlet which works as a drip loop to prevent water from getting into the set.

The outer door protects the transmitter mouthpiece, receiver and generator crank, the only parts visible when the door is opened, while the second or inner door protects all the apparatus within the case. Electrically, the set is the same as an ordinary magneto instrument containing practically the same apparatus. Here, however, the resemblance ceases as the mechanical features are entirely different. Besides being encased in a cast-iron box, every piece of apparatus is individually and thoroughly treated to protect it against the inroads of moisture and corrosive mine water and gases.

The generator springs are covered with asphaltum paint. The generator terminals are mounted on a hard-rubber block and after connections are made, they are covered with a waterproof compound. Switch-hook springs and ringer terminals are covered with asphaltum paint and compound respectively. The induction coil is mounted in a hard-wood case, the parts of which are boiled in linseed oil before they are put together. These boxes are not glued, but are fastened by means of brass screws, while the spaces between the sides and the induction coil are filled with waterproof compound.

To prevent battery trouble, the cardboard cartons are thoroughly impregnated with waterproofing compound to prevent the absorption of moisture which would otherwise short-circuit adjacent cells. To safeguard the batteries still further and prevent them from coming into contact, circular holes, each large enough for one cell, are provided in the wooden block under the batteries. All wiring is done with red-rubber core cable, fastened with insulating tape and treated with asphaltum paint. Every exposed iron part is triple electro-galvanized.

State Investigation of Fume Damage in California

The injury and damage done by fumes from California smelting plants is to be investigated by a commission, created by an act of the legislature, passed May 9, 1913. The commission is composed of the state veterinarian, the secretary of the state board of health and the state commissioner of horticulture. It is directed and empowered to make an investigation of the injury to animal life and vegetation caused by smelting plant wastes, and the extent thereof. Upon the completion of the investigation the commission is to make a report in writing to the governor, giving in full all the facts and circumstances ascertained. If it be ascertained that the wastes from smelting plants and establishments where metal is extracted from ores cause serious injury to animal life or vegetation, it shall be the duty of the governor to notify the attorney-general of the facts and circumstances. Thereafter it shall be the duty of the attorney general to bring action in the name of the people in the State of California to discontinue the discharge of wastes that are harmful to animal life and vegetation. An appropriation of $5000 is provided to carry out the provisions of the act. Other bills had previously been presented in the legislature for the purpose of regulating and controlling the plants and compelling them to operate under a license. But these bills were objectionable and not such as could have been successfully carried out if they had become laws. The owners and managers of smelting plants in California have never objected to properly constructed laws and they are apparently well satisfied with this last act of the legislature on the subject. The selection of the three state officials is satisfactory, and there is no reason to believe that the investigation will not be carried on satisfactorily. Whether this commission will perform the actual duty of the investigation or employ expert assistants has not been made known. The commission selected by the supervisors of Solano County, of which Doctor Holmes is the head, will, no doubt, work in harmony with the state commission. It may be found advisable to select the Holmes commission to make the investigation for the state commission in other counties of the state. That would be a satisfactory plan so far as the smelters are concerned and should be entirely satisfactory to the farmers.

Dredging at Idaho City

The Boston & Idaho Gold Dredging Co.'s 15-cu.ft., Yuba Construction dredge, at Idaho City, made a remarkable record during 1912, handling 3,775,398 cu.yd. of gravel or an average of 314,616 cu.yd. per month. The highest yardage in any one month was in October, 1912, when 361,190 cu.yd. were handled. So far as we know, this is the highest monthly record, as well as the highest annual yardage, ever made by a 15-cu.ft. dredge. The nature of the ground is partly responsible, as from 75 to 90% of the gravel passes through the screen.

Canadian Lead Bounties

In the budget just submitted to the Dominion Parliament, the Canadian Government proposes to extend the lead bounties, provision for which expires on June 30. These bounties were first authorized in 1903, to continue for 10 years, the total payments not to exceed $6,000,000. In fact, the amount actually paid out has been about $5,400,000, leaving $600,000 unexpended. The present proposition is to extend the bounties for five years. When the price of lead in the London market is over £17 8s. 9d. per ton, payment of bounties will cease until the price falls below that figure.

The Crushing-Surface Diagram

A typographical error occurs in line 39, first column on p. 1040, where "values" should read "volume."

In Figs. 4 and 5, the reference to "This area equals," etc., should be accompanied by an outline, including six of the small squares when referring to the area between the screen-analysis curves. In Fig. 5, 50 ft.-lb. should be represented by an outline including 7½ squares, and in Fig. 4, 25 ft.-lb., by six squares.

Reported in New York

Stocks of copper in Europe decreased again in the first half of June. We have been assured from quarters where there ought to be positive knowledge that copper is not being accumulated in private warehouses in Europe and we have had some independent confirmation of that statement.

The copper production of American smelters in April, 1913, according to our own statistics, was 136,848,080 lb. The April refinery production was 135,353,402 lb.

CORRESPONDENCE AND DISCUSSION

Calculation of Extraction in Cyanidation

In the JOURNAL of Mar. 8, 1913, H. A. Megraw, in his article, "Silver Cyanidation at Tonopah—III," states that in most of the mills there, the calculation of extraction is performed by using the content of bullion produced plus the content of tailing discharged as the content of head samples. This, no doubt, is excellent from the point of view of the millman in charge of the plant and doubtless saves him much worry, but from the point of view of accuracy it leaves something to be desired.

There may be serious errors constantly occurring, which, with the above mentioned method of calculation, would never be supected. Quite considerable quantities of bullion might be stolen and no one be any the wiser. Moreover, there is no way of finding out if there is any serious unnoticed leakage in the plant.

No doubt the assayer can be checked with duplicate samples, but the greatest test on his work and on the tonnage calculation is whether the output of bullion tallies with the theoretical quantity required. With careful work there should be no reason why the bullion output should not check within reasonable limits. This gives satisfaction to every one concerned and then, should there be any serious discrepancies, the cause will probably be noticed almost at once, whereas with an adjusted method, such as that used at Tonopah, there can only be an accumulation of error.

The fact of crushing in solution complicates the mill-head sample slightly, owing to metal being dissolved while in the mortar box, and also by the bullion content of the cyanide solution in circulation. However, a fair sample of the mill-head can be obtained from the pulp on leaving the mortar boxes. If this is assayed, and also the solution before and after it comes in contact with the ore, the proportion of solution to ore being known and its bullion content allowed for, the original content of the ore can easily be calculated. The pulp, of course, will have to be washed before assaying.

Extractions varying between the limits of 60% and 120% are certainly annoying, but this sort of thing is almost inevitable. However, these variations only happen from month to month and the important matter is what the annual result is going to be; the monthly reports are only to see how the production is progressing. It stands to reason if for several months an unusual quantity of bullion is taken from the zinc boxes and extra zinc acided, which usually happens at the end of a financial year in order to balance accounts, that the actual production for those months will be in excess of the theoretical.

Later, owing to less short zinc being present in the boxes, the bullion distributes itself over a larger proportion of long zinc than usual, with the result that not so much bullion is cleaned up and there is an apparent shortage. Conversely if there is an apparent shortage of, say, 20% on a 90% extraction, if calculations are correct and there is no other source of error, there is no reason why a month or two later, taking the extraction as being 90%, there should not be an actual extraction of 110%, making up for the original 20% left in the boxes. About the middle of the financial year, the boxes would be in normal condition and one would expect the theoretical and actual extractions to be about the same.

Taking the year 1912 at the Mijnbouw Maatschappij Ketahoen, the cyanide plant treated 47,597 tons of ore with a total content of 7160.7 oz. gold for a theoretical extraction of 88.7%, calling for 6350.55 oz. The actual gold recovered was 6325.22 oz., or an actual extraction of 88.3%, the difference being 25.33 oz. The silver called for was 19,315.46 oz., whereas 19,224.46 oz. were recovered, a shortage of 91 oz.

Monthly actual extractions varied between 59.5% and 123.3%. This has also been the case for the years 1909, 1910 and 1911 with equally close yearly results.

GEORGE SIMPSON, JR.
Mijnbouw Maatschappij Ketahoen,
Lebong Soelit, Benkoelen, Sumatra.
May 1, 1913.

What the Forest Service Does to the Prospector and Mine Owner

Under the above caption, I wish to correct two statements made by Leroy A. Palmer in the JOURNAL of May 17, 1913, under the heading of "What the Forest Service Offers the Prospector," the impression being given to the uninformed reader that the procedure outlined by him is universal in the practice of the Forestry Bureau.

Possibly Mr. Palmer has not been employed by the Forest Bureau long enough to know that the practice in some cases, at least, does not agree with the procedures laid down in the different forest manuals and use books which have been issued, which are rarely seen by the general public and are difficult to obtain, for his article is seemingly sincere and is certainly well written. At any rate he but echoes part of an address delivered by District Forester Smith Riley on Feb. 4, 1913, at Denver, Colo., before the Colorado Chapter of the American Mining Congress. Mr. Palmer's statements will be disproved in two particulars by a recent local instance, the facts as to which can be easily verified, without unduly prolonging this communication by citation of the many more flagrant cases which have been reported from time to time in previous years as having occurred in Colorado, Montana and other states.

Mr. Palmer quotes correctly, so far as he quotes at all, and I will quote him verbatim. He says:

But a ranger does not inquire into whether a discovery has been made. If the claim is in a recognized mineral locality, if the requisite expenditure of $500 has been made, and if the indications are that it is being held in good faith and not as a subterfuge to acquire ground for other than mining purposes, he will make favorable report.

An opinion, quite general, seems to prevail that contests against supposedly invalid claims are initiated on the report of the ranger, who, it is true, sometimes has little or no knowledge of mining. This is incorrect.

This is correct in some cases, as will be shown.

Mr. Palmer admits that the usual forest ranger has little knowledge of mining. I have noticed that most of the forest rangers in the West are ex-cowboys or ex-sheepherders. There is no intention to disparage cowboys as a class. For certain duties of forest management and control, probably no better class of men could be had; but no one will accuse the ordinary cowboy of being qualified by training, experience, education or natural cast of mind to act as mining or mineral expert; yet he must and does pass upon the most vital and intricate questions pertaining to what constitutes a discovery, as well as other features of mining laws and decisions. The more intelligent and honest of the cowboy rangers will not claim to possess such qualifications; yet their dictum goes, and while it may not be final, the burden of proof that he is unqualified, and that his objections to a mineral application are trivial and not well taken is thrown on the claimant, and not on the Forestry Bureau, and the expense of this is usually heavy. In fact, in the whole elaborate system of rules and regulations devised by the adroit and capable former chief of the forest service, to magnify his bureau and promote espionage, landlordism and tax-gathering, so far as they relate to the marriage of the Department of Agriculture and the Department of the Interior, it is carefully arranged that after the Forestry Bureau has started something through the ignorance of its employees lowest in rank, it can sit back and let the claimant and the General Land Office fight it out, while the main expense of the fight always falls on the claimant. Mr. Palmer goes on to say:

On receipt of a report from a ranger showing the noncompliance with the above conditions, the mineral examiner is detailed to the case. The mineral examiner is a man who must have had actual mining experience. He qualifies, etc., etc. The mineral examiner makes an exhaustive investigation of the claim, measuring and estimating the work and also considering the question of character and extent of discovery, and if it develops that no discovery has been made, as well as the claim being deficient in other respects, the facts are reported to the General Land Office. If the commissioner considers the facts sufficient to justify cancellation of the application for patent the claimant is informed of the charges against the claim, and given an opportunity to present his evidence at a hearing.

Now, for the specific recent instance where this procedure was not followed. The Manhattan, Nev., mining district is situated across the south end of the Toquima range, which is embraced in the Toiyabe forest reserve. The timber embraced in the reserve consists of scrub cedar and piñon, valuable only for fuel and to a limited extent for mine timber and stulls of poor quality and strength, suitable only for workings of shallow depth. The boundaries of the reserve extend in many places out into the adjacent plains and valleys where there are no trees or shrubs other than sage brush.

The mineral belt of the district extends in an easterly and westerly direction across the range. While there are many other veins and mineral zones, the main mineral zone consists of a thick bed of uptilted, altered and replaced limestone, extending along the longitudinal axis of the mineral belt. This zone is cut at frequent intervals by north and south fractures and faults with vein filling, the main movement of the fault blocks between these north and south fractures being in a horizontal direction. The main orebodies are found at the intersections of these fractures or veins with the main ore zone mentioned, and oftentimes in these fractures at a long distance from axis of main ore zone, and in schists and other formations cut by them.

Two claims, endlining with each other, upon which an approved patent survey was had last autumn, extend in an easterly and westerly direction in close proximity to and upon the axis of the main ore zone. The White Cap vein, one of the principal producers of ore in the district, outcrops near the south line of the westerly claim and again near the southeast corner of the easterly claim, both outcrops being within the boundaries of the two claims as surveyed. A smaller parallel vein extends through the claims near their lode lines. There are also a number of cross veins running in a northerly and southerly direction. The two claims embrace but few scattering piñon trees, have no springs or other water supply, and control no means of access or right-of-way to the reserve. All mine managers, superintendents, mining engineers and leasers in the district have always recognized the territory embraced as distinctly and decidedly mineral ground and useless for any other occupancy purposes whatever. About $10,000 has been expended for the development of the territory embraced in the survey, several leases have been given thereon at different times, and ore has been milled therefrom. Within a year past a large amount of ore has been milled from adjoining and conflicting claims on the south side and the west end, while at an earlier date ore was milled from near-by claims to the north.

Application was made for patent in December last, and final proof and payment for the land was made early in March, 1913. The issuance of the register and receiver's final receipt did not follow as usual, in due course, and the attorney-in-fact for the claimant was unable to learn definitely the reasons for suspension of issuance of the final receipt until May 15, 1913, when a notice was received from the Register of the U. S. Land Office at Carson City, Nev., of which the following is a copy of all that is essential to this discussion:

By authority of General Land Office letter "P," dated May 8, 1913, you are hereby notified that a forest officer has filed the following charges against the validity of your mineral application, No. 07533, made Dec. 5, 1912, for the ....., and ..... lode mining claims M. S. 4073 to wit:

(1) That there has been no discovery of mineral in rock in place upon the said ..... lode claim.

(2) That less than $500 on labor and improvements has been expended upon or for the benefit of the ..... lode claim.

Then follows the requirement to answer objections and make appearance within 30 days, or the application will be held for rejection or cancellation.

The "forest officer" referred to in the foregoing notice is the local forest ranger. No field examination of the ground has been made by any competent examiner of either the Forestry Bureau or the General Land Office. The local forest ranger admits that not to his knowledge has such an examiner been on the ground for such purpose. Here is an instance where the claimant is put to a great expense to meet unfounded charges of a ranger alone, and expenditures to that end have already commenced. Mr. Palmer, or anyone interested, is challenged to disprove the foregoing assertions.

Under the head of why claims are examined is the following statement in the "National Forest Manual," by H. S. Graves, taking effect Feb. 1, 1912:

As to mining claims, it should especially be borne in mind that good faith almost necessarily exists when the claims are located on untimbered and unwatered lands which control no means of access or rights-of-way and are valueless for any occupancy purposes.

This and a few other paragraphs which are to be found in some of the publications of the bureau, including its Use-Book of 1907, read fairly; but the actual practice is not in accord with them. The paragraph quoted and a few others seem to indicate that a supervisor or ranger was expected to exercise some discretion, judgment and common sense in making reports; but these qualities certainly are not exercised in many cases. It is believed that lists of questions and secret circulars and letters of instructions issued to supervisors and rangers, all of which are carefully kept from the inspection of the general public, prevent such officers from exercising any personal discretion and judgment. If this is not so, then some of them are stupid, and the bureau's lists of such officers badly need revision.

In the last two paragraphs of his communication, Mr. Palmer undertakes to show the beneficent effect of free-use permits for fuel and timber; and gives a lot of figures to show what the practice amounts to in dollars and cents and perhaps to exploit his knowledge of Scribner's log rule and other figures. Free-use permits are no longer issued in the Toiyabe reserve. If one goes out and picks up a decayed limb on the ground, he must pay the ranger for it. At least, he says so. How far free-use permits have been discontinued in other forest reserves is not known to me. Certain it is that the granting of free-use permits is not universal, as the reader would be sure to infer from Mr. Palmer's statement.

The free-use permit is a trifling matter. The matter of charging for every possible thing in a reserve or any privilege connected therewith, is a large one, upon which a volume could be written. On page 44 of the Use-Book of 1907 are given some 40 special uses and privileges for which the forest employees may charge. These are outside the many charges which relate to timber and grazing.

I will only say that the first act pertaining to forest reservations and subsequent acts did not contemplate or provide any material changes from preëxisting laws which always allowed the free use of fuel and timber for domestic purposes within certain limits and under certain restrictions. Certain rather obscure and inexplicit clauses in the act of June 4, 1907, of Feb. 1, 1905, of June 30, 1906, of Mar. 4, 1907, and, perhaps, in later ones, have been made the basis of the most remarkable set of rules and regulations for the gathering of heavy and indirect taxes which have ever been promulgated. Most of these taxes go into the coffers of the bureau, and are borne wholly by the pioneers of the West, who often have extraordinary burdens in other forms.

Bureaucracy or bureaucratic government, the promulgation and execution of Czar-like rules and regulations by a bureau, which, while oftentimes having no basis in an existing law, have all the effect of laws of Congress, has had a rapid growth in the last 15 years in the United States. The most striking example of the obnoxious features of bureaucratic government is shown by the Forestry Bureau. Seemingly its former energetic head has built up a system to magnify the importance of his bureau, and forward his own political fortunes more than to promote the general welfare of the people, at least of the West. No one of intelligence has any quarrel with the general principles of conservation. Be it understood that I have always from my youth been strongly in favor of all practical measures to prevent the useless destruction of the forests, on account of their close connection with the irrigation and other water supplies in the West as well as the degradation of soil areas in the New England and other Eastern states, and am still enthusiastic on the subject, as well as on the reforestation of denuded areas when this can be done.

J. C. KENNEDY.

Manhattan, Nev., May 21, 1913.

Multiplied Hoisting-Machine Duty

Some time ago the JOURNAL published a photograph of a Nova Scotia mining camp in which four shafts were shown, from which hoisting was done with a single installation. This is not such an uncommon performance as it appears. In the development of a new field, prospecting operations are often cramped by considerations of economy, and machinery is frequently called upon to perform double or triple duty. The accompanying photograph shows a shaft house and 10-stamp mill stand-

A HOIST THAT SERVES THREE SHAFTS

ing upon the Holman gold mine in the Caribou gold district, in the early development of which, under my personal supervision, hoisting was conducted from three shafts by a single hoisting engine. The photograph shows the ladderway and slide of a double-compartment inclined shaft, and to the left of these the ladderway of a triple-compartment vertical shaft, the ore coming from workings connecting with each of these being raised to the sorting deck above their collars and, after being broken, going directly to the ore bins feeding the mill. The third shaft is not shown in the picture, but it is a double-compartment vertical shaft about 60 ft. south of these, and the ore came to the same sorting deck. The explanation of the necessity for such an arrangement is that I was engaged in developing the dome of an anticlinal fold on both its north and south legs and on its eastern and western plunge. Economy and convenience combined to dictate the arrangement, long since replaced, of course, by adequate hoisting machinery for each shaft, that which was merely a prospect when this photograph was taken, three years ago, having developed into the leading gold producer of the province today.

C. VEY HOLMAN.

Caribou Gold Mines, Nova Scotia, May 28, 1913.

NEW PUBLICATIONS

The secretary of the Canadian Mining Institute announces that a general index of Vols. I to X, inclusive, of the "Journal" of the Institute is now in press. The book comprises about 400 pages and will be in two parts. The first section contains brief outlines or summaries of the several papers published in these volumes, and the second section is devoted to the index itself. The names of authors and titles of papers are distinctly indicated by the employment in one case of large capitals and in the other of italics. In addition to the regular references to the page and volume of the transactions in which each article appeared a reference will be found to the page in the first section of the book on which is printed a summary of the paper in question. This feature will no doubt add to the usefulness of the index. The price of the volume in paper cover is $4, or $5 in half-leather binding.

UEBER ABBAUFOERDERUNG. By Arthur Gerke. 6¼x9½, pp. 305, illus., paper; 10 marks. Gebrüder Böhm. Kattowitz, O. S.

THE EAGLE RIVER REGION, SOUTHEASTERN ALASKA. By Adolph Knopf. Pp. 60, illus. Bull. 502, U. S. Geological Survey, Washington.

ORE DEPOSITS OF THE HELENA MINING REGION, MONTANA. By Adolph Knopf. Pp. 143, illus. Bull. 527, U. S. Geological Survey, Washington.

OIL AND GAS WELLS THROUGH WORKABLE COAL BEDS. By George S. Rice, O. P. Hood and others. Pp. 101, illus. Bull. 65, U. S. Bureau of Mines, Washington.

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DIE VERHANDLUNGEN UND UNTERSUCHUNGEN DER PREUSSISCHEN SEILFAHRT-KOMMISSION. 9x11, pp. 319, paper. Wilhelm Ernst & Sohn, Berlin, Germany.

PORTLAND-CEMENT MATERIALS AND INDUSTRY IN THE UNITED STATES. By Edwin C. Eckel. Pp. 401, illus. Bull. 522, U. S. Geological Survey, Washington, D. C.

REPORT ON THE BUILDING AND ORNAMENTAL STONES OF CANADA. Vol. I. By William A. Parks. Pp. 376, illus. Canada Dept. of Mines, Mines Branch, Ottawa, Can.

PETROLOGICAL CONTRIBUTIONS TO THE GEOLOGY OF WESTERN AUSTRALIA. By R. A. Farquharson. Pp. 100, illus. Bull. 43, Western Australia Geological Survey, Perth.

THE DEVONIAN AND MISSISSIPPIAN FORMATIONS OF NORTHEASTERN OHIO. By Charles S. Prosser. Pp. 574, illus. Fourth Series, Bull. 15, Geological Survey of Ohio, Columbus.

THE COMMERCIAL TREND OF THE PRODUCER-GAS POWER PLANT IN THE UNITED STATES. By R. H. Fernald. Pp. 99, illus. Bull. 55, U. S. Bureau of Mines. Washington.

THE GEOLOGY OF THE WAIHI-TAIRUA SUBDIVISION, HAURAKI DIVISION. By James Mackintosh Bell and Colin Fraser. Pp. 192, illus. Bull. 15 (New Series), New Zealand Geological Survey, Wellington.

REPORT ON MINING OPERATIONS IN THE PROVINCE OF QUEBEC DURING THE YEAR 1911. Pp. 207, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec, Can.

THE UNDERGROUND WATER RESOURCES OF THE COASTAL PLAIN PROVINCE OF VIRGINIA. By Samuel Sanford. Pp. 361, illus. Bull. No. V, Virginia Geological Survey, Charlottesville.

GEOLOGY AND WATER RESOURCES OF A PORTION OF SOUTH CENTRAL WASHINGTON. By Gerald A. Waring. Pp. 46, illus. Water-Supply Paper 316, U. S. Geological Survey, Washington, D. C.

MECHANICAL DRAWING—A Treatise on Technical Drawing as Expressed through the Medium of the Graphic Language. By Otho M. Graves. 6x9, pp. 138, illus. Chemical Publishing Co., Easton, Penn.

ADOLF LEDEBUR, DER EISENHUETTENMANN, SEIN LEBEN, WESEN UND SEINE WERKE. By Engelbert Leber. 6x8¼, pp. 155, illus.; 5 marks. Verlag Stahleisen, m. b. H., Düsseldorf, Germany.

GEOLOGY OF THE COLUMBUS QUADRANGLE, OHIO. By Clinton R. Stauffer, George D. Hubbard and J. A. Bownocker. Pp. 133, illus. Bull. 14, (Fourth Series), Geological Survey of Ohio, Columbus.

FAUNES JURASSIQUES ET CRETACIQUES DE SAN PEDRO DEL GALLO. By Carlos Burckhardt. 9x13, pp. 264, with 46 plates in separate volume; paper. Bull. 29, Instituto Geologico de Mexico, Mexico, D. F.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1911. Part I—Metals and Nonmetals Except Fuels. Waldemar Lindgren, Chief Geologist. Pp. 400, illus. Bull. 530, U. S. Geological Survey, Washington, D. C.

INVESTIGATION OF THE PEAT BOGS AND PEAT INDUSTRY OF CANADA, 1910-1911. By A. Anrep. Pp. 61, illus.; 12 maps in separate inclosure. Bull. No. 6, Canada Department of Mines, Mines Branch, Ottawa.

THE MINING GEOLOGY OF THE KANOWNA MAIN REEF LINE, KANOWNA NORTH-EAST COOLGARDIE GOLDFIELD. By T. Blatchford and J. T. Jutson. Pp. 106, illus. Bull. 47, Western Australia Geological Survey, Perth.

MITTEILUNGEN AUS DEM EISENHUETTENMAENNISCHEN INSTITUT DER KOENIGL. TECHN. HOCHSCHULE BRESLAU, Vol. I. Edited by Oskar Simmersbach, 7½x11, pp. 224, illus.; 14 marks. Verlag Stahleisen m. b. H., Düsseldorf, Germany.

MESSUNG VON GASMENGEN. Genaue Messung der durch eine Leitung strömenden Gas-(Luft) menge mittels Drossel Mess-scheibe (Staurand). By Joachim Brandis. 7¼x10½, pp. 87, illus., paper; 2.50 marks. M. Krayn, Berlin W., Germany.

IRON AND STEEL. An Introductory Textbook for Engineers and Metallurgists. By O. F. Hudson. 5¾x9, pp. 173, illus.; $2. D. Van Nostrand Co., New York.

This small book is an effort to summarize only the important principles of the metallurgy of iron and steel and "practical details of the methods of production have been avoided almost entirely." It is consequently not of much use to engineers or metallurgists engaged in the art, but to the outsider who needs to become familiar with general principles it may no doubt be a convenient reference, just as an encyclopedia article might be.

IRON MINING IN MINNESOTA. By Charles E. van Barneveld. 6x9, pp. 215, illus., paper. Bull. 1, Minnesota School of Mines Experiment Station, Minneapolis.

The publication of this book by the University of Minnesota is practically an innovation in mining literature. It is an example of the monograph applied to mining methods; its success is unquestionable. While the Minnesota iron ranges yield themselves easily to such treatment because of the high degree of standardization to which mining methods have there attained, particularly on the Mesabi, the example of this publication is one which may be followed by other states with profit to themselves, to the mining industry, and to technical science. The greater part of the bulletin is, of course, devoted to the Mesabi range, as the premier producer of the country. One associates with the Mesabi such subjects as prospect drilling, steam-shovel mining, sublevel slicing, sinking through soft formations, etc., and is not disappointed in finding them here exhaustively treated, outlines of general practice being supplemented by descriptions of specific examples. The Western Mesabi, Cuyuna and Vermilion ranges receive adequate treatment and sufficient attention is given to the historical and geological features and to methods of shipment. The absence of an index is only partly compensated for by the rather complete table of contents. A list of the illustrations also might well have been included, especially in view of their high quality. The photographs are well chosen and well reproduced. Many of the line drawings are on large folded inserts and thus offer a great convenience in being capable of examination without the turning of the page containing the accompanying descriptions. In view of the general excellence and value of the bulletin, any criticism of its typographical errors would seem captious. Professor von Barneveld is to be congratulated on the production of a thorough, exact, authoritative, and clearly written book, fully worthy of the industry it describes.

CONCENTRATING ORES BY FLOTATION. By Theodore J. Hoover. 6x9, pp. 221, illus.; $3.75. The Mining Magazine, London.

During the last seven or eight years a new system of mechanical concentration reversing the actions in ordinary gravity concentration and introducing new physical principles, has come into extensive use. The new system is appropriately referred to as flotation. It originated in the United States, we are proud to say, but its commercial and technical development took place in Broken Hill, N. S. W., largely in connection with the work of the Zinc Corporation. In this development, T. J. Hoover, author of the present treatise, played an important part, and it may therefore be recognized immediately that this, the first book on the subject, comes from an experienced and authoritative hand.

Mr. Hoover has gone into all the phases of his subject—the historical, legal, theoretical and technical—and has appended a bibliography of remarkable completeness. As is well known, the flotation processes have been the subject of bitter and spectacular patent litigation, which has spread to the United States and in which no decisive, sweeping judgment has yet been rendered. Mr. Hoover has summarized this in what appears to be a fair and unprejudiced way, but this section of his book is the least satisfactory, no doubt because he was hampered by the obligations of previous professional connections.

In his presentation of the theoretical and technical phases of his subject he is wholly satisfactory. The reader is bound to feel that although a more illuminating book may be written in future years he has been put in possession of all the essential knowledge so far as the present state of the art goes. For this the profession owes a debt to Mr. Hoover. The flotation process is certain to find extensive application in the United States. It is valuable therefore to have so useful a book about it as has opportunely been given us.

EDITORIALS

Mining Taxes in Northern Mexico

The American owners of mining property in Sonora have been in a dilemma respecting the payment of their mining taxes. Practically all of that state, except Guaymas, is in the control of the "constitutionalists," who are in opposition to federal government. A *pronunciamento*, calling for the payment of mining taxes in advance, has been issued by the state or "constitutionalist" authorities, and some of the companies have found it advisable to comply with that demand, but generally their taxes are either being withheld or are being paid directly to the Department of Hacienda, in the City of Mexico, the latter being permissible under the federal regulations.

An American consul in Sonora has communicated the following: "The state government holds possession of practically the entire state and is trying to collect the mining taxes. However, as this is a federal tax, the mining agent of Nogales has assured Americans that there will be no fine for delinquency if they do not pay these taxes immediately. Consequently most of the Americans have withheld payment. However, some, who have valuable improvements at their mines which might be subject to seizure, have paid to the state authorities."

The matter has been specifically referred to the attention of the Department of State at Washington. The following communication concisely states the case: "Mr. X is prepared to pay the taxes due. If he pays the Sonora government he has no assurance that the federal government will ultimately recognize his payment and protect him in his rights to the property. If he pays to the federal government, he does not know that he may not also have to pay to the state government in case its control becomes permanent. In the meanwhile, owners' penalties are accruing."

The following reply in behalf of the Secretary of State at Washington, by J. B. Moore, counselor, has been received:

> In reply you are informed that, on Apr. 26, in reply to information received from the Consul at Nogales to the effect that the so called constitutionalists were insisting upon the payment of taxes to them by the American owners of mining and other property, the department telegraphed the consul that such taxes should be paid under protest, that the protest should, so far as possible, be made a matter of record in each case, and that properly authenticated receipts should be secured for all taxes paid. The consul was further advised that, according to generally accepted principles of international law, the American citizens in question were entitled to pay taxes to persons in de facto authority. On the same date the department instructed the embassy at Mexico City to bring the matter to the attention of the appropriate authorities and to state that the United States Government would regard the payment of such taxes to such persons exercising de facto authority as completely relieving American citizens from further obligation with relation to these taxes.

This is a flat statement that the American government intends to protect its citizens in their property rights, providing they pay the regular taxes to such persons as be in actual authority; and that neither confiscation of their property nor duplicate exaction of the taxes will be permitted.

Iron Duties

The placing of spiegeleisen and ferromanganese on the free list, which has been proposed as an amendment to the pending tariff bill in the Senate at Washington, is not likely to make much difference in any way. In 1912, on a total production of 29,727,000 tons of pig iron, we made 96,346 tons of spiegeleisen and 125,378 tons of ferromanganese; and we imported nearly an equal quantity. For several years the quantities made in this country have not varied largely in relation to the make of pig, running about 0.7% of the total.

Nearly or quite all the ferromanganese made in this country is from furnaces owned by the Steel Corporation, and most of it is used in the steel works of the same company. The price to others in the open market is made by this material imported from Great Britain and Germany. That price is usually the highest the importer is able to exact. At the present time it is about $60 per ton at the seaboard and $2 higher at Pittsburgh. The proposed duty of 15% would not make a difference of more than a cent on a ton of steel, nor would it operate in favor of any special interests, as has been heretofore pointed out.

The proposed placing of pig iron on the free list is of somewhat greater importance. It is not likely to induce any large imports while quotations abroad remain as at present; nor indeed at any time except one of general slackness in the iron trade, when there might be a disposition to dump iron here. We think, however, that our makers could meet such conditions, with only a very moderate degree of protection beyond the ocean freight charges.

❋

Respecting Investments

Some questions of interest are these: Will the decline in some of the railway and industrial securities be permanent? Do they reflect in one case the adverse attitude of the public which will no longer permit them to earn so much money; and in the other case the unwillingness to pay the vendors' prices of yore? Will the wide fluctuations in the values of such stocks as Union Pacific and New Haven destroy confidence in the finest of these securities? Will the experience of Boston & Maine teach that an old established railway may pay dividends out of its principal and subsequently have to pay the penalty just like other mismanaged concerns? Will students of the Frisco affair conclude that even the name bond does not spell safety?

Out of such reflections may come the idea that mines are the safest form of investment, meaning, of course, good mines possessing known reserves of developed ore and the ability to yield a profit under ordinary conditions of the metal markets. Along with this goes the recognition that mining dividends are in part the return of the principal and should be treated accordingly. Given such mines as the Alaska-Treadwell, Homestake, Bunker

Hill & Sullivan, Miami, Nevada Consolidated, Chino, Ray and Utah, the investor knows what he has got and knows that it is not going to fly away. We have mentioned only some of those that figure in the American market. There are others of the same class in the London market. In the recent cataclysm of prices, the stocks of some of these companies offered $3 of value for $2 of cash.

We think that good mining stocks may become more fashionable among investors and eventually this interest may extend to the less established and developing mines and create a revival in the mining industry of our country. We do not mean to suggest any renewed propagation of wildcats, but we do think that an investor might as well take chances in a legitimate mining stock as in the rank and file of rails, judging from recent experiences, while as for the proved mines of the class that we have previously mentioned, their securities may be fairly rated with real estate.

⁂

Steel Trade Conditions

The steel trade in this country at present is in an unusual condition, and the opinions of experienced observers are much divided as to the outcome. On the one hand, the mills are generally making a heavy output and buyers are taking deliveries as fast as they can get them. Specifications under contracts come in steadily, and there has been no cancellation of contracts, buyers apparently feeling the need of all the material they have agreed to take. On the other hand, although the end of the second quarter of the year is rapidly approaching, when many existing contracts will expire, new business is in small volume, quite out of proportion to that of the current quarter. Many large buyers have provided but moderately for their needs in the third quarter of the year, and not at all for the fourth quarter.

In some quarters there is a disposition to put the present hesitation as to the future to the account of the impending tariff changes. It does not appear, however, that these will be sufficient to cause any reduction in prices of importance; certainly not enough to account for the hesitation now apparent as to the future. Rather it would seem that the steel market has fallen under the influence of the prevailing pessimism in Wall Street, though the relations between the Steel Trade and the Stock Exchange are not as close as they were two or three years ago. Scarcity of money and high interest rates have checked many speculative enterprises and so far reduced the prospective demand for material. There is every prospect, however, of good crops this year, and of a continued good purchasing power on the part of the consumer.

Perhaps—and this is an important point—we have been running rather too fast, and a halt is needed until consumption can catch up with production. Many observers think that this is the case; but others of equal authority disagree with this view, and think that a revival in buying will soon be apparent.

It does not seem probable that there will be any sudden break either way, and any general stoppage of mills and suspension of work is unlikely; while a sudden influx of new buying on a large scale is also hardly to be expected.

System in Details

The extent of the operations of the so called porphyry-copper producers may often be more clearly appreciated from a consideration of some detail rather than from a survey of the whole. When Mr. Marsh states, as in this issue, that 25 men are employed solely to oil part of the machinery in the Steptoe Valley concentrating plant, some idea of the size of the plant is at once obtained.

In operations of such magnitude, each department is the size of a small plant and requires the rigid inspection and attention to details that the superintendent of such a plant would expect to give to the operations under his direction. What may be effected by the installation of a systematic and scientifically studied method is shown in Mr. Marsh's article. When the saving on the dripping oil, caught and filtered and used the second time, is perhaps $200 per month, and when the saving of the whole system is given at 20%, a rough conception of the total absolute saving can be had.

The detailed description of the methods followed should be both interesting and suggestive as to what can be obtained in the way of economies when the scale of operations permits.

⁂

How many mines are there in the United States? This is a question that often is asked us. As nearly as we can determine there are about 6500 coal mines. Of metal mines there are about 6000, producing and developing. With respect to the metallurgical works we can speak more accurately. There are nine copper refineries and 45 smelteries. There are 28 lead smelting works, 28 zinc and 314 iron. There are 159 openhearth steel works and 30 bessemer works. Thus there is a total of 613 metallurgical works of the classes herein enumerated.

⁂

The Rand mines are making the largest output on record and their addition to the world's stock of gold is welcomed. Five years ago many economists and financiers were worrying about the flood of gold and were prophesying lower rates of interest on bonds. Now it seems that the world does not possess gold enough and new bonds are notoriously fetching greatly enhanced rates. It will be recollected, perhaps, that we argued five years ago that the increasing gold production was no cause for alarm and that probably the world's stock of this metal had not increased in the same ratio as the increase in commerce and industry. The recent absorption of large quantities of gold by India has no doubt been a factor in the situation.

⁂

The point of view makes a great difference always. Some of our compatriots foresee ruin to American industry as the result of the passage of the tariff bill now pending in Congress, but the German newspapers are characterizing the self-same tariff bill as a contrivance of devilish ingenuity to kill the German export trade to America. British financiers attribute the recent slump in the stock market to lack of nerve on the part of American investors, while American commentators are pointing to Europe as the source of our troubles. So it goes, and will forever.

BY THE WAY

In describing the sinking of the Brakpan shaft on the Rand, Charles B. Brodigan, in his Clement Le Neve Foster lecture, notes the force of workmen for each shaft as consisting of 300 natives and a few white men. The shafts were large, of seven compartments, and measuring 9x42 ft. in rock section. Supposing the work to be done with three shifts, the force for each shift would be something over a hundred men. An American engineer remarks that it must have been necessary to make the shaft so big in order to get all the natives in.

❋

An interesting contribution to the theory of ore deposits is quoted from *Merck's Report* by a contemporary. A Philadelphian, and, therefore, absolutely to be trusted, describes a New Mexican mountain of alum two square miles in extent, "of volcanic origin, and it would not be surprising if pure aluminum metal would be ultimately found." Here's one who would be some surprised. "Enormous beds of lignite are at hand to produce the power necessary for its reduction, at a cost one-fourth to one-half that of hydro-electric power," but what hydro-electric installation is meant is a deep mystery.

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At the Kristianssands Nikkelraffineringsverk, in Norway, a Peirce-Smith converter has been installed to treat a low-grade copper-nickel matte, carrying only 6 to 8% combined of these two metals. The operation is a small one and with the quantity and grade of matte available a pour of 2½ tons per 24 hours is made of 75% bessemer metal. As customary with copper-nickel mattes, blowing is stopped when the copper and nickel approximate 75%. The converter is of an unusual size, the shell being only 14 ft. 7 in. long, though of standard diameter, 10 ft. The commercial results with a matte of such low grade will be awaited with interest. An 18 to 20% matte is the lowest previously worked as a commercial operation in these converters.

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According to Mr. Farrell, there is a total of 56,000,000 tons of steel rails at present in use in this country. Of this, between 500,000 and 600,000 tons are taken up every year and rerolled into lighter rails. The capacity of the rerolling mills of the country is about 750,000 tons per year. The Grand Trunk Railway has a rerolling plant of its own, where it rolls its obsolete and worn-out rails. About 2,000,000 tons of steel scrap are used every year in steel manufacture, this scrap taking the place of about 4,000,000 tons of iron ore, which would be consumed were scrap not used in steel-making. Scrap is selling at present for $12 per ton, compared with $27 per ton for steel billets. The price of steel scrap and that of pig iron follow each other closely.

❋

The *Wall Street Journal* is responsible for the weird story that there is a man in Wall Street, who, for 30 years, has invested or speculated in mining stocks on a system, and has not yet cashed a bet. He bought only the cheapest stocks, paying in no case more than 15c. per share, expecting, of course, that most of them would prove worthless, but hoping that some few might appreciate in value, and make the speculation, as a whole, a winning one. The net result of his operations is that, in the period of 30 years, he has accumulated 1,298,404 shares of 155 different varieties of mining stocks, that the stocks stand him in $125,000, that none of them ever paid a dividend, and that there is now a bid price for only four of the 155 varieties. His holdings of these four he could sell for approximately $250.

❋

A new "electric-agitator" ore treatment is being developed in Oregon. "The ores are crushed and volatilized by means of the intense heat of electric carbons. A chemical solution then precipitates the metal, which is then extracted by the electrolysis method, which in its simplest form consists in passing an electric current through the solution" . . . . "The carbon dioxide and hydrogen sulphides emanating from the ordinary smelter are eliminated, and the vegetation surrounding the plant is not destroyed." . . . . "A special helix has been installed and special carbon electrodes for the furnace. A specially designed air-vaporizing precipitation pump, used to liquify the ore, is a necessary piece of equipment." We judge the word "special" is also a necessary piece of equipment, which ought to draw overtime pay. The promoter "frankly confesses his belief that the process is superior to any of the usual processes." We desire to make some mental reservations on this point.

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A correspondent sends us the following "pome," by J. B. Randall, in the *Malheur Mining News:*

MINING EXPERTS

Come, listen, fellow miners, and a tale I will relate
'Bout the facts concerning mining, right here within this state;
This country's overburdened with so called mining men
Who will bond a mine, black-eye the camp; then leave the state again.

They put on their yellow leggins, and with little pick in hand,
Look wise and air their knowledge and ignore a common man;
They talk about geology, or some rock which ends with —ite.
Then build a good-sized stamp mill—not a pound of ore in sight.

Here's a case in plain philosophy—come, listen, if you will—
If you educate a burro, you will have a burro still,
And your college-bred expert is just as competent
As this animal I've mentioned for a superintendent.

See the stamp mills lying idle, about a score or more;
First-class mine equipment, with not a pound of ore!
Why? Because they "learned" their "mining" (not underground, I say),
But in some eastern college—that's why our mines don't pay.

A word to you investors who are seeking mining claims:
When you send out your agent, send out a man with aims,
Commission a real miner to investigate the mine,
Not a man who's never seen one—it isn't in his line.

For there's failure after failure, recorded every year.
And pocketbooks depleted by sending "experts" here;
Yet we have dividend-payers, soon they'll begin to loom;
Mark you well! the town of Malheur will once more commence to boom.

We commend the above views to the attention of the exploration and development companies, not because of the novelty of the views, but because there will surely be interest in dividend payers that are lying fallow. The records of those companies have shown it to be rather difficult to find promising mines purchasable on reasonable terms. We hope that something may be done to relieve the unhappiness of Malheur, even if the mining expert has to be abolished.

PERSONALS

Rensselaer H. Toll, of Denver, is at Dillon, Montana on professional work.

Harry J. Wolf is examining mining properties in the western part of Nevada.

Franklin W. Smith, of Bisbee, Ariz., sailed from New York, June 11, for England. He will return early in August.

Kirby Thomas of New York is engaged on the examination of an iron property in Berks county, Pennsylvania.

Howland Bancroft has returned to Denver after an absence of a month in New York, Boston, Washington, and other Eastern cities.

Dr. P. D. Quensel, of Sweden, is in Ottawa, aiding the Canadian Geological Survey in making arrangements for the holding of the International Geological Congress.

D'Arcy Weatherbe has withdrawn as partner from the firm of Bainbridge, Seymour & Co. as from June 1, and has taken offices and will continue practice at 62 London Wall, E. C., London, England.

H. C. Enos, who has been temporary superintendent of the Angangueo unit of the American Smelting & Refining Co. in Mexico, is now temporary superintendent of the Charcas unit of the same company.

Bernard MacDonald is making his headquarters again at the Sierra Madre Club, Los Angeles, Calif., having recently come from Parral, Chihuahua, which has been cut off from mail or railroad communication, since the first of April, on account of revolutionary troubles.

OBITUARY

Mrs. Julia H. B. Moffitt died in New York, May 13, aged about 40 years. She had been at one time well known in New Mexico and Colorado as a prospector and promoter. Seven or eight years ago she was also rather prominent in New York in connection with the promotion of the Victoria Copper, the Sierra Consolidated and other mines. For several years she was connected with the firm of Hopper & Bigelow, and with the syndicate headed by Warner Miller.

Maurice L. Muhleman, formerly deputy assistant treasurer of the United States, died at his residence at Bronxville, N. Y., June 12, aged 61 years. Mr. Muhleman had been in the service of the Treasury Department for nearly 30 years; in 1872 he entered the Department at Washington, where he remained for 14 years; the succeeding 15 years he was located at the Sub-Treasury in New York, retiring from the Government service in 1901. Mr. Muhleman was an authority on financial topics; several volumes dealing with the subject of monetary systems were written by him, besides which he was the author of some works on banking. He was a recognized authority on currency and banking. He was a member of the Finance and Currency Committee of the Chamber of Commerce, a member of the New York Historical Society and other organizations.

SOCIETIES

Southern Oregon & Northern California Mining Congress—The convention of this association was held at Redding, Calif., May 21-23, with a large attendance. A report was received from a special committee on agricultural conditions in the vicinity of the smelting plants in Shasta County. The committee reported that present conditions at the Kennett works showed an entire absence of harmful fumes. A resolution was adopted recommending the creation of a State Commission for the investigation of complaints growing out of alleged damage by smelter fumes. Another resolution recommended a new connection between the California and Oregon state roads. Address were made by State Mineralogist F. McN. Hamilton and R. S. Taylor; John Crawford, Jr., read a paper on the electric smelting works at Heroult. Visits were made to those works and to other points. The following officers were elected: President, I. J. Luce, Etna Mills, Calif.; first vice-president, L. L. Ray, Medford, Ore.; second vice-president, W. H. Roberts, Redding, Calif.; third vice-president, H. H. Noonan, Weaverville, Calif.; secretary, W. D. Egilbert, Redding, Calif.; treasurer, John E. Pashburg, Yreka, Calif. Ashland, Oregon, was chosen as the place for the next meeting.

American Institute of Mining Engineers—The Board of directors of the institute has authorized the holding of a meeting under the auspices of the Iron & Steel Committee in New York, Oct. 16 and 17. The following papers are promised for this meeting:

1. H. M. Howe. "Discussion of the Existing Data as to the Position of Ae_3."
2. H. M. Howe. "Equilibrium Temperature for A_1 in Carbon Steel."
3. H. M. Howe. "The Divorcing of the Eutectoid in Meteorites."
4. H. M. Howe and A. G. Levy. "Determination of the Position of Ae_3 in Carbon-Iron Alloys."
5. J. W. S. Crowe and H. S. Rawdon. "Thermal and Microscopical Examinations of Professor Howe's Standard Steels."
6. J. H. Hall. "Shock Tests of Cast Steel."
7. H. F. Miller, Jr. Title not yet decided.
8. E. Stütz. "The Scoria Process."
9. Albert Sauveur. "Mayari Steel."
10. Felix A. Vogel. "Briquetting."
11. J. E. Johnson, Jr. "Cast Iron."
12. R. R. Abbott. "Influence of Alloying Elements on the Carburizations of Steel."

As far as possible these papers will be published in the Bulletin before the October meeting and will also be mailed in pamphlet form to any member requesting it.

The Committee has good reasons to expect additional papers by several eminent steel manufacturers. Members intending to present papers should notify the secretary as early as posible, giving the title of the paper and the probable date at which the manuscript may be expected.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

HOISTING CAGE—George S. Rice, Pittsburgh, Penn. (U. S. No. 1,063,285; June 3, 1913.)

LAMP—Miner's Acetylene Lamp. John Courtenay, Forbes Road, Penn. (U. S. No. 1,063,419; June 3, 1913.)

MINE CAR COUPLING. James Dubois, Secondo Novario, and John E. Jones, Westville, Ill. (U. S. No. 1,062,823; May 27, 1913.)

MINING CARTRIDGES—Improvements in Mining Cartridges. N. Field, Newcastle-on-Tyne, Eng. (Brit. No. 16,536 of 1912.)

CENTRIFUGAL SEPARATORS—Improvements in Centrifugal Separation. W. Mauss, Johannesburg, S. A. (Brit. No. 27,113 of 1912.)

CRUSHING AND GRINDING MILL. Julius Mohs, Dessau, Germany. (U. S. No. 1,063,463; June 3, 1913.)

WASHING—Improvements in Machines for Washing or Separating Coal, Ore and Other Granular and Like Materials. R. S. Benson, St. George, Durham, and Head, Wrightson & Co., Ltd. Thornaby-on-Tees, Eng. (Brit. No. 10,929 of 1912.)

CRUCIBLE FURNACE—Portable Crucible Furnace. Matthew Harvey, Walsall, England. (U. S. No. 1,062,970; May 27, 1913.)

FURNACE LININGS—Materials for Use in Making Up, Repairing, and Replacing Linings, Etc., of Metallurgical Furnaces. John E. Baker, York, Penn. (U. S. No. 1,063,102; May 27, 1913.)

FURNACE LININGS—Process of Preparing Material for use in Making Up, Repairing, and Replacing Linings, Etc., of Metallurgical Furnaces. John E. Baker, York, Penn. (U. S. No. 1,063,103; May 27, 1913.)

REDUCTION—Improvements in or Relating to the Reduction or Oxidation of Metallic Ore or the Like. A. E. Bourcoud, London, Eng. (Brit. No. 10,381 of 1912.)

SAMPLING—Plant or Apparatus for the Sampling of Ores. Arthur Stebbins Clift, London, England. (U. S. No. 1,062,636; May 27, 1913.)

INDUSTRIAL NEWS

W. & L. E. Gurley, of Troy, N. Y., will have an exhibit of engineers' and surveyors' field instruments; water-stage registers and current meters; physical and electrical laboratory apparatus; standard weights and measures; and accurate mercury thermometers at the annual meeting of the Society for the Promotion of Engineering Education, which will be held in the Engineering Building of the University of Minnesota, Minneapolis, Minn., during the week beginning June 23.

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—June 12

Symmes' Pamphlet is the cause of a suit in the Superior Court, in which damage is demanded from the Mexican Gold & Silver Mining Co. of Nevada by two San Francisco stockbrokers. The plaintiffs are W. H. Moise and Julius H. Berghauser, each of whom claims he has been damaged in the sum of $25,000 by the publication of a pamphlet written by Whitman Symmes. The Mexican directors had nothing to do with the writing or publicity, except that the pamphlet was distributed from the office of the company and H. L. Slosson personally delivered it to several persons. The pamphlet is in answer to one issued by the plaintiffs in March in which they attacked the directors, and particularly Mr. Symmes who is reported to have stated that he is glad the suit has been filed as it will give opportunity to expose the brokers. The Symmes pamphlet is an appeal to the stockholders to deal with honest brokers instead of crooks. The stockholders in other mines than the Mexican also received this pamphlet. The codefendants in the suit are Whitman Symmes, W. C. Ralston, G. E. Arrowsmith, and John Landers.

The Diverting of Tailing of the South Eureka stamp mill from Sutter Creek, has left that stream with a scant flow of water. The result is that the sewage from the town of Sutter Creek has obstructed the flow of water and is causing some uneasiness to the citizens of the town. In November, 1912, the landowners and farmers along the creek, both in Amador and Sacramento Counties, complained that the tailing was damaging the land and the crops. An injunction suit was brought and by its terms all the mines were compelled to prepare to take care of tailing within a reasonable specified time. The South Eureka was the first to make preparation. The tailing plant was completed in December. It is composed of 900 ft. of flume and an open ditch 1800 ft. long, and a tunnel under the public highway. The plant takes the tailing direct from the mill into a dry ravine. Thus the South Eureka has obeyed the injunction. This mine buys 62 in. of water, and pumps about 40 in., for use in the stamp mill. All this water formerly went into Sutter Creek, carrying the tailing with it. The sewage from the town of Sutter Creek was washed out with the tailing. In dry seasons, the water flowing from the South Eureka and other stamp mills kept Sutter Creek alive. The Kennedy, the Central Eureka and the other mines to the north, are preparing to meet the demands of the injunction, and when all the mines on the Mother Lode in Amador County from Jackson to Drytown shall have their tailing plants in operation, the people of the towns and the owners of land on the streams affected will discover that they are in about the same plight that the Sutter Creek people now find themselves. The worst of it is that there is no economic way for the Sutter Creek people to change the condition. They cannot compel the South Eureka and other mines to turn their tailings into Sutter Creek nor to supply Sutter Creek with fresh water.

DENVER—June 14

Another Cripple Creek Merger is now under way and is said to include the Moon Anchor, Ethel Louise and Anchoria Leland, Charles W. Howbert being manager.

A Denver Curb Market is now proposed by brokers. It is to be organized with strict rules and regulations to govern the trading, where the buyer and seller of local mining, oil, and industrial stocks can meet and do business. Western mining and Wyoming oil stocks will be the favorites, and a meeting is to be held soon to perfect the organization.

Paradox Valley has been examined by Charles L. Parsons, chief of the division of mineral technology of the Bureau of Mines at Washington, accompanied by Dr. Howard A. Kelly, of Johns Hopkins Medical School, Baltimore, who are now in Denver as the guests of Dr. R. B. Moore of the local branch of the Bureau of Mines. They made a thorough examination of the mineral belt of Paradox Valley which lies in the extreme western part of Montrose County, Colorado, and the eastern part of San Juan County, Utah. The immediate aim of the trip was to ascertain the extent of the deposits of carnotite ore, and how to conserve the supply for the radium it contains. Mr. Parsons said much ore was being wasted, and as the deposit is not inexhaustible, some method of saving it must be found, for only the higher grades are being shipped to Europe, the rest being thrown on the dumps and lost. Doctor Kelly, who is said to have, in his laboratory in Baltimore, the greatest supply of radium in America, and is an authority on its therapeutic uses, is only interested in the research from a physician's standpoint. It is said that a British syndicate, of which L. C. Hecquenberg of New York is the manager, has secured control of the property containing the rich uranium-vanadium ores that carry the radium. This mine employs 50 men and the ore is hauled by four-horse teams 40 miles to Placerville, the nearest railway station. From thence it is shipped to Liverpool, England, for treatment.

BUTTE—June 11

The First Trial Trip under electric power was made June 4 on the Butte, Anaconda & Pacific R.R., from Anaconda to Gregson Springs, midway between Butte and Anaconda. A heavy box car was attached to one of the new electric motors that will be used in freight and passenger service, and the trip was made without a hitch. The work on the Butte end of the line is progressing rapidly; wires are being strung on the network of spur lines connecting the mines with the main line, and it is expected that within a month passenger service will be begun under the new power, and that ore hauling from the Butte mines to the Washoe smeltery will be done by electricity soon afterward.

Northern Pacific Land Grants remaining unapproved will be examined this summer to determine whether or not they are mineral bearing. The government has authorized Ira Lantz, chief of the fourth field division of the Department of the Interior, whose office is in Helena, to employ eight additional mineral examiners for the district embracing Montana. The Northern Pacific obtained this land, exclusive of land designated as mineral in character, as a bonus for building the road, it having been granted the selection of every alternate section within 50 miles of either side of the track. A classification of the land was made, which caused dissatisfaction, and the report was not approved. The examiners are wanted for making a reclassification of the land.

SALT LAKE CITY—June 12

Power Site Withdrawals from entry by order of the Secretary of the Interior total 14,600 acres of land along Huntington Creek.

Silver King Coalition Company has filed a petition in the United States supreme court for a writ of certiorari in the case wherein the Silver King Consolidated Mining Co. received a judgment amounting with interest to about $900,000 for ore extracted from the Vesuvius claim owned jointly by the two companies. The Silver King Coalition asked for a stay of proceedings until Oct. 13, when the supreme court begins its autumn term. The Consolidated opposed any stay longer than until June 9, and the United States circuit court of appeals, sitting at St. Paul, decided that the Coalition must ask for a writ of certiorari by the latter date. If the writ is granted the case will go to the higher court for review; if refused, the matter is finally settled, and the Consolidated company may proceed to collect the judgment granted by the lower courts. It is understood that the motion for the writ is based on the grounds that the court erred in holding the present company responsible for ores extracted by the old Silver King Mining Co., which the Coalition company bought out. The Consolidated contends that the Coalition is responsible for ores extracted by the old company, and that the writ of certiorari is made to bring a case before the supreme court, which would not otherwise get there, on the grounds that there are certain new legal points to be brought out. Briefs were filed by both companies in Washington June 9. The survey ordered by the United States district court in the case of the Silver King Consolidated versus the Silver King Coalition company for the collection of $750,000 for ores alleged to have been wrongfully extracted from several mining claims owned by the plaintiff, was started May 26, and has been completed. The maps will be filed with Judge Marshall as soon as the office work is done.

HOUGHTON—June 14

Labor agitators representing the Western Federation of Miners caused the closing down, the last of April, of the Mass Consolidated mine. The Western Federation has been represented in this district for several years, but has not been recognized by any of the mining corporations. Two labor parades were held in the spring, and there has been talk of a strike since the first of the year. Mining was resumed at the Mass, June 1, with about 100 of the 265 men employed when the mine shut down. The wire mill at Dollar Bay, owned by the Roebling interests, is to be increased to double its present capacity. The new plant will be the Western agency of the Roebling company.

Osceola Lode Exploration work at the Wolverine mine has been suspended because of little promise of good ore at greater depth. Operations at the Ojibway in Keweenaw County were suspended June 4 because of lack of capital. Walter Harvey Weed arrived in Houghton May 13, after a trip through Mexico. Mr. Weed is the new publisher of Stevens Copper Handbook and will make his home in Houghton for some time. The Douglas Copper Co. filed articles of association May 29. The company is incorporated by six Houghton and Hancock men to operate a mine in Keweenaw County. Two offices will be maintained, one in Houghton and one in Boston, Mass. There is practically no copper on hand at present at Lake Superior ports. There has been no dockage accumulation since the opening of navigation, which indicates a good demand for copper.

Finer Grinding and Cheaper Power for this grinding are the two subjects at present of paramount interest to the mining men in the Michigan copper country. The Baltic mill now has in operation a low-pressure turbine driven by the exhaust steam of the steam stamps. The Calumet & Hecla is installing a similar turbine which is designed to develop 7500 kw. This power will be used in part to regrind in pebble mills the 30,000,000 tons of stamp sands in Torch Lake, to regrind sands now being produced, and, in part, to run the new electrolytic refining plant now under construction. Five hundred tons of stamp sands from the Calumet conglomerate dumps have been shipped to Montana to be tested by the Peck centrifugal concentrator at Anaconda. The Thomas A. Edison interests have secured an option on a royalty basis on the Quincy stamp-sand dump. A series of experiments will be made in which electrical methods will be applied to determine the commercial value of the waste stamp sands. Three new pebble mills are being installed and a new boiler house is under construction at the Centennial mill at Point Mills. The reopening of the Nonesuch property in Ontonagon County, by the owners, was of interest to the milling men of the district. A small experimental mill, with a Lovett concentrator to save the fine copper, was erected. The plant began operations Apr. 1 and continued running for several weeks. The new process proved a success, but the work was stopped to raise more funds. The same experiments are now being made at the Carp Lake property, in the same county.

DULUTH—June 12

The Minnesota Rate Decision will not have to be heeded by the Duluth, Missabe & Northern and the Duluth & Iron Range (Steel Corporation) roads. The reason is that those roads did not take advantage of the opportunity to restore the 3-cent-per-mile passenger rate which was afforded after the appeal to the United States supreme court was taken, pending the decision by that body, but allowed the 2c. rate ordered by the Minnesota State Warehouse & Railroad Commission to stand until decision was made on the appeal. The action of these roads in this matter has won public esteem. As to commodity rates, these two roads are well within the requirements as affected by the decision.

The Steel Corporation Investigation makes it of interest to take notice of the independent operators on the Mesabi range. There are more such operators now than there were eight or 10 years ago, and more independent mining men are seeking to establish themselves on that range and other iron-mining districts in Minnesota. Most of the independents have their furnace connections, and all of these are bigger, and their operations larger, and more uniform from year to year, than before the Steel Corporation was organized. The independents that are represented on the Mesabi range, most of whom have furnace connections, are: Jones & Laughlin Pickands, Mather & Co.; Shenango Furnace Co.; Rogers, Brown & Co.; Republic Iron & Steel Co.; Mahoning Ore Co.; M. A. Hanna & Co.; La Belle Iron Co.; Oglebay, Norton & Co.; International Harvester Co.; Arthur Iron Co. (Hill ore lands); A. B. Coates and associates; White Iron Lake Iron Co.; Allan mine; Cavour Mining Co., and Joseph Sellwood and associates. The Arthur Iron Co. will be ready to ship from some of its properties that are now being stripped, in 1914, and in 1915 will be in possession of all of its Mesabi properties, for the Steel Corporation lease will expire under the order of concellation on Jan. 1, 1915. The Jones & Laughlin company is conducting exploratory work with drills on the western Mesabi, where it recently acquired some leases which were dropped by the Steel Corporation. Among these properties is one called the Buckeye. The overburden in this western Mesabi territory is mainly sand, and stripping the ore is general practice in preparing for mining operations. Much of the surface is deep for profitable stripping with steamshovels, and it is said that Jones & Laughlin will operate suction dredges where the overburden is deep. The Pittsburgh Steel Ore Co. property on the Cuyuna range is being stripped by hydraulicking; the formation there is also sand. A body of high-grade hematite ore, resembling the Zenith ore at Ely, has been located 6 ft. below surface on the East Extension ground of the Consolidated Vermilion, on the Vermilion range. The south wall has been found, but not the north wall. It looks like an important steamshovel proposition, a rare thing on the Vermilion. The Section 30 company, however, has mined a substantial tonnage on a part of its property with steamshovels.

PORCUPINE—June 13

The Western Federation of Miners, Porcupine branch, at a recent meeting, voted to call off the strike. While the mines have been running at normal capacity as regards workers, this step will have a beneficial effect, inasmuch as the better class of miners will no longer stay away from the camp in the fear of trouble. Practically all the provincial police have been taken out of the camp and the few guards which were kept by the various mines will no longer be necessary.

GUADALAJARA—June 8

Rebel Activity has recently been noticed in the Hostotipaquillo mining district of Jalisco, but operations have not been affected as a result. Rebels entered the El Favor and Cinco Minas camps, but in neither instance was an attack made, and they withdrew after receiving small cash contributions. Inability of the National Rys. to handle freight at intervals during the last month, due to a shortage of fuel oil for locomotives, has curtailed shipments from the Hostotipaquillo district, but notwithstanding the fact considerable high-grade ore and bullion have been sent out by the El Favor company. A big tonnage of ore is now awaiting shipment. This Makeever company paid a second dividend of 1c. per share at the end of April. Much ore from the mines of the Mololoa Mining Co., another Makeever enterprise, is being milled at the El Favor plant. Mololoa development is very satisfactory. A small experimental plant is in operation at the Casados mines of the Consolidated Mining Co., and work is in progress on a plant that will treat 100 tons daily. This company has much rich ore sacked awaiting the reopening of the Torreon smelting works, with which it has a contract. The Cinco Minas company is continuing extensive development. Due to traffic conditions in the country, no effort has been made to bring in machinery for the big Cinco Minas reduction plant. The Amajac Mines Co. expects to have a 50-ton cyanide plant in operation before the end of the year, and is developing with excellent results. The Espada Mines Co. is milling steadily. A fourth Krupp tube mill is in operation at the plant of the Amparo Mining Co., in the Etzatlan district of Jalisco, and the daily average of ore milled is now 290 tons. A third Oliver filter is being placed, and with this in operation the tonnage will be increased to more than 300 tons per day. A new body of ore averaging nearly 1 kg. silver and from 10 to 20 grams gold per ton has been opened to the south of the principal workings, and surveys are being made for a third shaft to tap it. The two quarterly dividends paid by the Amparo so far this year have been 4% each. The concentrating plant of the Magistral-Ameca Copper Co., at the Magistral mine in the Ameca district of Jalisco is now being operated steadily, day and night, with very satisfactory results. Ore averaging 5% copper is being crushed, and from 15 to 18 tons of concentrates are being turned out daily. The Magistral concentrating plant was recently overhauled, and Isbell and Dunham tables added. Additional tables are on the way to the plant, and when these are in place the output will be increased. The plant has a crushing capacity of 200 tons daily. The Mexican Mines Co., owning the old Bolaños mines in the Bolaños district of Jalisco, has suspended operations, due to the impossibility of securing machinery because of traffic interruptions. The company is ready to put in pumping machinery for the unwatering the lower workings of the old mines, but at present there is no hope of getting the machinery to the camp. A general improvement in conditions will be awaited. The company recently completed a 100-km. wagon road from the camp to Colotlan, from which place there is a stage road to Zacatecas.

THE MINING NEWS

ALASKA

MINNIE CLAIMS (Shoup Bay)—A rich shoot of free-milling ore was lately found by the men engaged in annual assessment work on these claims. Development work has just been started.

LITTLE GIANT (Valdez)—This property owned by H. L. Jaynes and associates, has been bonded, and work will be started at once, under the supervision of Jaynes. The claims are on Mineral Creek.

BUD MINING CO. (Valdez)—In addition to its quartz mining operations this company is now installing a hydraulic plant for washing gravel in Gold Creek where pay in large quantities has been discovered.

ECLIPSE (Bennett)—This property has been financed so that development work can be done this season. The ore contains gold and silver, and recently made assays indicate that some of it is of excellent grade.

BIG FOUR (Valdez)—This property is on Mineral Creek and is being worked by Cook & Cooper, who have uncovered a vein of high-grade ore, which is now being followed. When enough ore is blocked out a mill will be built.

SEALY-DAVIS (Valdez)—This property is under lease to J. M. Davis and Charles Sealy. Last winter a shipment of ore was made to the stamp mill at Valdez, the average return being $50 per ton. The claims adjoin the Cliff and the vein has been tapped at a depth of 300 ft. The orebody is large and the average pay is said to be $30 per ton.

GRANBY CONSOLIDATED M. S. & P. CO. (Grand Forks, B. C.)—This company has secured a two-year lease on the Mount Andrew copper mine on Prince of Wales Island. This mine was located more than 15 years ago by the late Samuel Lichtenstadter, and is one of the best known copper properties of the north. More than $250,000 is to be expended, according to the terms of the lease, in the development of the property. The work of gathering men and materials will begin at once, and within a year the mine will be shipping. The lease was made with an option to purchase at the end of two years.

ARIZONA

Maricopa County

ORO FINO (Winnifred)—This mine is reported sold to Nevada men.

ILLIZONA MINING CO. (Phoenix)—The stamp mill has been destroyed by fire of unknown origin. W. A. Smith, resident manager, estimates the loss at about $10,000, which is largely covered by insurance. He also stated that it was his belief that the Chicago men who are financing the enterprise would rebuild the mill at once as recent development work has opened a quantity of milling ore.

Mohave County

GOLD BAR—This property west of the Flores has been taken over by Pasadena, Calif. men who will commence sinking a deep shaft.

TENNESSEE—The new strike on the 900-ft. level 300 ft. north of the shaft continues to hold in width and grade. Shipments are being made regularly to Needles.

FRISCO—All alterations having been completed, and the mill is now in operation. The capacity has been doubled and many improvements have been made to reduce the cost of treatment.

WHITE ELEPHANT—Two carloads of ore shipped recently from this mine in the Pacific Improvement camp near Cerbat gave high returns in silver, and lead. W. E. Dunlap is in charge.

COPPER MOUNTAIN—A considerable tonnage is being shipped via Grand Gulch making a wagon haul of more than 80 miles. The ore is said to assay 40% copper with some gold and silver.

BOUNDARY CONE—The drift on the 520-ft. level is in good ore although the rich shoot has not been reached. The grade of the ore in the drift shows a good increase over that in the level above.

GRAND GULCH—Large shipments of sorted ore are being made. The ore is hauled by auto trucks to the Virgin River then across on wogons and to the railroad at St. Thomas. The ore shipped assays about 12% copper.

Pima County

GUIJAS—Extensive milling and concentrating tests are being made on the tungsten ores from this property. Only a small force is being employed in the mines at present, pending the results of these tests.

OCEANIC—The mill and cyanide plant are now being operated steadily and satisfactorily. The first creanup will be made early in June. Now that the mill is in shape the working force in the mine will be increased.

GOLD BULLION—The day shift has been increased and the shipping tonnage doubled. In addition to the shipping ore a large amount of milling ore is being rapidly developed. The last shipment to Dougles returned more than $95 per ton.

COLONIAL COPPER CO. (Ajo)—Bondholders are taking steps, it is reported, for a foreclosure of the mortgage on this property on account of the company defaulting June 1, interest on the first mortgage 5% bonds. It is expected that a receiver will be asked for the company. Under the laws of Maine, the company organized, with capitalization of $3,000,000, shares $10 par, nonassessable, and $1,750,000 in stock was issued. The company authorized bonds to the amount of $500,000 at 5%. The Colonial Copper Co. is a reconstruction of the Growler Copper Co. It is claimed that work upon a part of the 30 claims on an area of 600 acres has uncovered copper, silver and gold ore. Donald Smith and others, shareholders, sued Morrill and Moseley, the president and treasurer of the Growler company, who hold corresponding positions in the succeeding company, alleging that they delivered to themselves 75,000 shares of stock and $5500 cash, the latter being paid under contract to Charles J. Foxwell, a promoter, who tried in 1909 to interest English capital. The plaintiffs asked to have the transfer of the property set aside, but apparently the petition was denied.

Yavapai County

GOLD KING—After six years of idleness this old mine in the Crown King district is to be reopened. Extensive development is planned.

WIZARD—The long adit on the property of the Fortune Mining Co. has been driven 800 ft. all in ore which has maintained remarkable uniformity of width and grade.

Y-P MINING CO.—This company operating the Cash mine near Senator recently purchased an auto truck for hauling ore and supplies. A new road connecting the mine with the state highway is being completed.

COMMERCIAL—New teams have been commissioned to deliver 40 tons of ore daily at the Skull Valley station for shipment to Douglas. The mines which are in the Copper Basin district have a large tonnage developed.

CALIFORNIA

Amador County

SOUTH EUREKA (Sutter Creek)—A total of $9000 was paid in dividends May 1. This is at the rate of 3c. per share. For the last year or more the dividends have been suspended owing to the expense of developing the Oneida. The recent disclosure of ore in the drift between the South Eureka and the Oneida will cause the Oneida mill to be put in commission again, and the prospect is good for continuance of dividends and an increase in the amount.

ARGONAUT (Jackson)—The orebody has been encountered in the 300-ft. drift on the 3900-ft. level. The Argonaut ore, like that of the Kennedy, is showing better grade with depth. The county supervisors have granted a permit to the company to construct a ditch 1000 ft. long to convey tailing to the Hoffman ranch. This is preliminary to a plan to elevate the tailing to a proposed reservoir on the ranch, to avoid further litigation with farmers.

Butte County

HUPP—This mine near De Sabla has been bonded to a company of which W. M. Meek, of Oroville, is president and W. H. Corbiere is manager. An incline shaft has been sunk 100 ft. which intersects the bottom of an old 150-ft. vertical shaft from which a drift 150 ft. long had been driven. The old workings failed to cut the Indian Spring channel. A water-power pumping plant has been installed and the old workings will be pumped out.

Calaveras County

ANGELS—A winze is being sunk on the main vein from a crosscut at the 850-ft. level.

REINER (Stockton)—The installation of hoisting machinery and pumps is completed and the rebuilding of the mill is in progress. The mine will be unwatered and the extraction of ore resumed. The old plant was destroyed by fire last December.

HEXTER—A Price gravel mill of 250 tons capacity has been installed at this property. A 2100-ft. tunnel was driven and a channel of gray gravel 200 ft. wide and averaging seven feet in depth has been encountered. Water is used for power. S. M. Hughes, of Mokelumne Hill, is manager.

LIGHTNER (Stockton)—Alexander Chalmers has assumed charge as superintendent, and will reopen the mine. It is expected that 20 stamps will be started as soon as the extraction of ore is under way. Mr. Chalmers was superintendent for the present company prior to the taking over of the mine by the Lightner Gold Mining Co., which recently relinquished the purchase option to the Lightner Mining Co.

TANNER—The new 2-stamp mill was ready for operation May 20. A Nagel compressor has been installed; air drills will be employed. A 600-ft. tramway has been built from the level of the present tunnel to the mill and a new tunnel will be driven to cut the vein. More than 900 ft. of development work has been done in the last year, mostly in pay ore. East Belt Development Co. is owner; George Lucas, of Oakland, is secretary; John Campbell, of Murphys, is superintendent.

Eldorado County

BEEBE (Georgetown)—This property is to be opened as soon as rights on an extension of the vein to the south are obtained.

SLUG GULCH MINING CO. (Fair Play)—This company has been incorporated to operate the Slug Gulch mine. The flume

and ditch will be repaired and rebuilt, and a working tunnel will be driven. Gold was discovered here in 1878 when the property was the home of Nathaniel B. Hall. Several large nuggets or "slugs" were washed out in the early days, but the property has not been operated regularly. The flumes carried about 75 in. of water in the dry seasons and 3000 in. in wet seasons.

Kern County

KELSO TUNGSTEN—The prospects located and partially developed by Frank Feldman, Claude Halloway and R. Roschl have recently been examined by David Atkins, manager of the Atolia Mining Co. There are eight locations situated 55 miles northwest of Randsburg. The vein is said to be 12 ft. wide and the ore carries gold, silver, copper and tungsten.

G. B. LEASING CO.—The installation of the roller mill at this mine, one mile south of Randsburg, is completed, and the electric motor has been connected to the Randsburg substation of the Southern Sierras Power Co. The new cyanide plant is also ready for operation. This plant is looked upon with interest as it is believed that cheap power and cyanide treatment will solve the low-grade ore problem in this district. A large tonnage of ore is blocked out for extraction.

AMERICAN TRONA CORPORATION—Articles of incorporation have been filed at Dover, Del., for this company with an authorized capital stock of $12,500,000 The company, the capital for which it is understood will be supplied by New York and San Francisco men, will manufacture potash and borax from the alkali deposits at Searles Lake in the Mojave Desert. It is stated that the construction of a big plant is to be started at once. The statement is also made that preliminary work is now going on for a railroad 25 miles long to connect the plant with the Southern Pacific R.R. The incorporators are Richard Bennett, William K. Dupre, Jr., and J. A. Brown.

Inyo County

SALINE VALLEY SALT CO. (Bishop)—It was expected that the tramway would be completed and ready for a tryout about June 15, the cables having been installed. The crushing machinery is on the ground at Swansea. A 24-in. gage track has been laid on the salt field, extending one-half mile toward the center of the field. Sixteen cars have been received to be used in hauling the salt to the wire tramway. The cable will be driven by a donkey engine until electric power can be secured. It is expected to deliver salt to the railroad at Owenyo in July.

Nevada County

YOU BET—The hydraulic mines owned by the estate of J. S. Goodwin will be bonded to E. F. Banning and others of Los Angeles. Permission has been granted by the superior court to carry on hydraulic mining.

Placer County

GAYLORD DREDGE—This dredge, on Rattlesnake bar near Auburn, is digging in good ground at a depth of about 35 ft. Deeper sand is reached by a pump. E. C. Gaylord, of Auburn, manager.

HERMAN—It is reported that the pump in the main shaft was dropped to the bottom of the sump by the breaking of a chain, and that it is probable that a new pump will be installed to unwater the mine and recover the old pump.

Plumas County

CLAYBANK—It is reported that advancement of the tunnel in this channel mine, near La Porte, is to be resumed. The tunnel is about one mile long and was driven to cut the Gibsonville ridge channel. John Thomas is manager.

COLORADO

Clear Creek County

MINNESOTA GOLD MINING & TUNNEL CO.—This is a new organization with capital stock of $200,000, formed to develop and operate the Keith property in the Morris mining district.

NEVADA GOLD MINING CO.—This company contemplates early resumption of operations at its property on Seaton Mountain. The shaft will be unwatered and the drift will be advanced.

SUNBURST—This property on Democrat Mountain has been secured under bond and lease by E. J. Butts, who contemplates extensive development. A small force of men is now employed to place the property in working order.

PHONOLITE—Operations have been resumed at this property on Alpine Mountain. The ore is shipped to Silver Plume and treated in the Scotia mill. The company contemplates the construction of an aerial tramway. L. B. Davenport is manager.

COMBINATION MILL (Idaho Springs)—Numerous alterations and improvements have recently been made in this plant, and the mill is now in operation on a supply of ore received regularly from the Two Brothers mine in Virginia Cañon and the Oneida mine at Freeland, both of these mines being operated by Owen & Rogers. A satisfactory saving is reported.

LITTLE GIANT—The annual stockholders' meeting will be held at Lawson, Colo., June 10. The most important business to come before the meeting is the consideration of the proposed purchase of the Commodore group of mines. The terms of purchase under discussion are $5000 cash, and the assumption of a mortgage on the property for the sum of $10,000, payable $5000 on or before two years and $5000 on or before three years from May 3, 1913, with interest at the rate of 5%. D. J. Donnelly is president.

TWO KINGS MINING CO.—This company will resume operations in the near future in Hukill Gulch. The shaft on the Centennial mine will be sunk 100 ft., and drifts will be advanced on the vein. If this preliminary development is satisfactory the sinking of the shaft will continue and additional levels will be driven. Some pay ore has been shipped from the property and occasional high assays in gold have been obtained. The mine is equipped with a shaft house and suitable machinery for preliminary work. The present plant cost about $5000. John F. Garber, of St. Joseph, Mo., is general manager.

Lake County

EVERETT PLACER (Dayton)—Hydraulic mining will probably be commenced at this gold placer in about 10 days, as the flumes will be completed by that time so water can be turned in from the Red Mountain fork of Lake Creek.

MOUNT CHAMPION (Leadville)—It is stated that the mill at this property in Lackawanna Gulch is running day and night on a large tonnage of low-grade ore, the mining of the smelting ore being suspended until electric power has been installed to run the compressor and machine drills. This power will be supplied by the Colorado Power Co., which has secured the contract, and will begin stringing the poles at once.

San Juan Region

THE OUTPUT FROM TELLURIDE for May was 104 carloads of concentrates. The gold bullion shipments are not given.

ORO-CASHIER (Ophir)—In crosscutting for the main vein a blind lode was cut 15 in. in width and assaying $40 per ton in gold.

BUTTERFLY-TERRIBLE (Ames)—J. B. Olson, lessee, is running 15 stamps on good ore and will drop another five stamps soon.

GENESEE (Ironton)—J. F. Thompson, who bought the properties of the Red Mountain Mining & Ry. Co. last autumn, has installed a small compressor at this mine and will employ eight or 10 men prospecting for ore in the veins already cut by the main tunnel.

HUMBOLDT (Sneffels)—Manager Farish announces that this company has decided to defer the building of a mill until next year, but extensive development will be continued. The Humboldt is an extension on the Ouray side of the divide of the Sheridan & Smuggler.

Summit County

WELLINGTON (Breckenridge)—Owing to the low price of spelter and zinc blende and the flat $3 freight rate on low-grade ores from the Breckenridge district, this company has decided to curtail the production of zinc-blende ores until the situation improves. The property will be kept in shape for a quick resumption of production when circumstances are propitious. The Wellington recently made a shipment of between 50 and 60 tons of lead-silver ore concentrates to the local Chamberlain-Dillingham sampler.

Teller County

CRESSON (Cripple Creek)—The production from this Raven Hill mine for May is given as 2000 tons.

GOLD DOLLAR (Cripple Creek)—The main shaft of the Mable M. on Beacon Hill is now nearly 1000 ft. deep, with good results being obtained.

VINDICATOR—(Independence)—In May 40 carloads of ore were shipped on company account, and 24 cars for lessees, the grade being from 1 to 1½ oz. gold per ton.

ISABELLA (Cripple Creek)—There are 26 sets of lessees working in this mine, and the production for May was about 1800 tons of 1-oz. gold ore on an average. This mine is now entirely under lease.

EL PASO (Cripple Creek)—In May, 152 carloads of ore were shipped from this Beacon Hill mine. A raise was made from the drainage tunnel level to the 1000-ft. level of the mine, and this is now being cleaned out and timbered and stations will be cut at the 1100 and 1200 levels.

PORTLAND (Independence)—Lessees produced 25 cars of milling ore in May, most of it coming from the 200 level where there are 18 sets of lessees. As water has been met, No. 2 shaft is not being sunk further, and the development of the 1600 level is said to be entirely satisfactory.

DOCTOR-JACKPOT (Cripple Creek)—The claims of the Work Mining & Milling Co., which were sold by the United States Marshal to satisfy a judgment secured by the Doctor-Jack Pot company, were taken under the sale at $100,000. The balance due under the judgment will, it is hoped, be secured through suits against the directors of the Work company, as well as the lessees, who took out the ore from the Little Clara, which the courts have found belonged to the Doctor-Jack Pot.

IDAHO

Bonner County

IDAHO-CONTINENTAL (Port Hill)—Final negotiations between President Klockmann of the Idaho-Continental and representatives of the International Smelting & Refining Co. for financing further operations at the Idaho-Continental mine have been concluded, and $125,000 is now available to carry on development at the property and complete the concentrator, power plant, wagon road and 15-mile transmission line from the power station to the mine. The new board of directors, A. Klockmann, William Wraith, J. B. Whitehill, A. I. Goodell and Richard Schacht, elected Mr. Klockmann, president; Mr. Goodell, vice-president and general manager, and Mr. Schacht, secretary-treasurer. M. H. Ganon, who has been in charge of operations since development was begun, will be retained as general superintendent, and the services of the geological and construction experts of the International Smelting & Refining Co. have been offered by Mr. Wraith, general manager of the smelting company, whenever required.

Coeur d' Alene District

IDORA HILL MINING CO. (Wallace)—The mill was completed recently and the plant is ready to operate as soon as the Washington water power company's transmission line to the property is ready, which will be about June 15. The mine is in shape to produce steadily.

MORNING (Mullan)—It is reported that the swelling of the shaft has caused a partial suspension of operations temporarily and about 75 men have been laid off until the trouble is repaired. Difficulty has been experienced several times in the shaft because of the pressure crushing the timbers, and as greater depth is reached the trouble from this source has increased.

MICHIGAN

Copper

MASS (Ontonagon)—Operations at "C" shaft are again under way after the temporary shutdown, due to impending labor troubles; one head in the mill is operating two shifts.

WHITE PINE (Ontonagon)—Sinking is going on in the three shafts at this property. Nos. 1 and 2 are below the fourth level, and considerable lateral opening has been done. No. 3 shaft is nearing the second level. The company is employing about 60 men. The rock coming from the openings is of uniform character and is being stored on a stock pile.

HOUGHTON COPPER (Houghton)—The winze which was put down from the 625-ft. level to a depth of 825 ft. is to be carried to a depth of 1025 ft., and laterals will be extended from the winze instead of sinking the shaft to that depth. Drifting continues at the 625-ft. level, but results of late have not been as good as attended earlier work. At the 825-ft. level of the winze, good ground continues to be broken.

CALUMET & HECLA (Calumet)—All the parts for the 7500-kw. mixed-pressure turbine have been received and the work of completing the installation is in progress, so that the plant will be ready to go into commission about Aug. 1. At the No. 2 regrinding mill, Hardinge mills are being installed. The 3000-kw. substation at the plant has been completed. At the new electrolytic refinery the building is completed and the traveling cranes are being installed, preparatory to the erection of machinery.

Iron

NEWPORT MINING CO. (Ironwood)—The five-compartment shaft on the Palms property is being sunk rapidly; one-man "jackhamer" drills being used.

TULLY (Iron River)—Some ore is being shipped from shaft No. 1; shaft No. 2 is being sunk slowly on account of water and sand trouble. A depth of 160 ft. has been reached and bedrock is 18 ft. deeper.

ROGERS—A large single-deck cage for hoisting men and timber has been purchased from the Lake Shore Engine Works by the Munro Iron Mining Co. for use at this mine. The cage is 10½x5x11 ft. high, which permits long timbers to be taken down.

HILLTOP (Crystal Falls)—This property and the adjacent Victoria property have been taken over by Cleveland men, and an attempt will be made to mine the known small body of ore. The mine was recently abandoned by the Oliver Iron Mining Co. before any mining was done.

MANSFIELD (Crystal Falls)—Stockpile shipping continues at this mine of the Oliver Iron Mining Co. It is likely that the company will abandon the property as soon as the stockpile is shipped. The mine has produced about 1,500,000 tons of ore since it was opened in 1890.

CORRIGAN, McKINNEY & CO. (Crystal Falls)—This company will surrender its lease on the Crystal Falls mine as its operation has become unprofitable. It is believed that about 50,000 tons of ore remain in the mine but this is inconveniently situated and the shaft is in poor condition. Nearly 2,000,000 tons of medium-grade ore has been taken from this mine since it was opened in 1882.

MISSOURI

Saint Francois County

ST. JOSEPH LEAD CO. (Herculaneum)—Fire destroyed the sintering plant at the smelting works of this company the night of June 14. Two-thirds of the blast furnaces are now in blast, but for four or six weeks, until the sintering plant can be rebuilt, the Savelsberg pots will have to be relied upon, and as that installation has only one-third the capacity of the sintering plant the furnace capacity will be restricted until the destroyed plant is replaced.

MONTANA

Butte District

TUOLUMNE (Butte)—The drift being driven on the 2000-ft. level of this mine, is progressing rapidly and opening good ore. The vein is 12 ft. wide at the breast, and the ore shoot averages about 6 ft. in width; the ore containing copper and silver. The crosscut being driven on the 2200-ft. level is expected to reach the vein by the last of June. From the nature of the ground and the ore developed on the 2000-ft. level, it is believed that the lean zone encountered on the 1800-ft. level, has been passed through.

ANACONDA (Butte)—The work of sinking the three-compartment shaft at the Pennsylvania mine, which was started some time ago from the 1800-ft. level, is progressing at the rate of about 60 ft. per month. A station has been cut on the 2000-ft. level, and crosscutting, both north and south, to the veins, is well under way. The shaft is now a few feet below the 2200-ft. level, and station sets are being put in at that level. A pump has been placed on the 2000-ft. level and the water on this level and from the shaft is being raised to the 1800-ft. level, where an electric pump raises it to the 1200-ft. level, from whence it flows through a flume in the crosscut driven about two years ago for that purpose, to the Leonard mine pumps, and thence to the surface, where the copper, carried in solution, is precipitated. Retimbering the Pennsylvania air shaft from the 1400-ft. level to the surface, was recently completed, and a single-deck cage for lowering timber and supplies is being operated to the 1600-ft. level, the present depth of the shaft.

Granite County

SWASTIKA—An electric hoist is being installed at this property near Philipsburg. Preparations are being made to use electricity for all of the development work at the mine, and a force of men is now engaged in setting poles for the power line.

MAGPIE—The gold dredge being operated by this placer mining company at Lake Sewall, 20 miles northeast of Helena, is being run night and day, dredging an average of 70,000 cu.yd. of earth and gravel per month. The dredge was installed two years ago at a cost of about $100,000, after the company had thoroughly prospected the large acreage of placer ground that it now owns. Electric power is used, the electricity being obtained from the power plant at the Cañon Ferry dam. It is estimated that the extent of the company's holdings will allow six years of continuous operation.

Lewis & Clark County

BALD MOUNTAIN (Marysville)—The 20-stamp mill is being operated two shifts, the ore coming principally from stopes on the 800-ft. level.

ST. LOUIS MINING & MILLING CO. (Marysville)—Operations were begun, May 14, at the recently completed stamp and cyanide mill. This company is operating a portion of the Drumlummon mine in addition to the St. Louis, and extensive development is being done at both properties. The tailings dump on the surface at the St. Louis mine will be treated in the cyanide mill.

Madison County

WATSEKA (Rochester)—W. D. Green, of Butte, recently sampled the tailings dump to ascertain whether or not it could be profitably cyanided. It is planned to build a cyanide mill or to ship the tailings for treatment.

ARBOR DAY—Bert Ribble, who is operating this gold property near Virginia City, has recently mined and placed on the dump more than 100 tons of ore, and is preparing to have it hauled to the Easton-Pacific mill for treatment.

NEVADA

Clark County

QUARTETTE (Searchlight)—The slime plant at this property has lately been completed by L. F. Le Brun representing the Colorado Iron Works. This plant treats 75 tons of slime daily having an average assay of $5 per ton, principally in gold; it contains 0.75% of copper. Akins classifiers and Portland filters are used. The gold is precipitated by zinc shavings. The average recovery is 94.6%, the consumption of cyanide being 2.75 lb. per ton of solids treated. The power for this entire plant is furnished by a 22-hp. Fairbanks-Morse engine. Charles H. Jonas and B. F. Miller, Jr., recently purchased the property for $450,000, including the Quartette mine of the Quartette Mining Co., the Rambler, Boston, Fourth of July, Red Iron, and John groups of mines, the Searchlight hospital, the Quartette R.R. Co., the Searchlight Western Telephone & Telegraph Co. of Southern Nevada, and mine equipment, buildings and homes.

Humboldt County

F. C. SHRADER, of the U. S. Geological Survey, who is making an examination of the Rochester mining district, has said, it is locally reported, that the veins in the vicinity of Nenzel Mountain are true fissure veins, and that there is no reason why they should not go down to a great depth.

CAUSTEN LEASE (Rochester)—The upper tunnel has cut the second vein and drifting has been commenced. In both the upper and lower tunnels two shifts a day are being worked.

COLLIGAN LEASE (Rochester)—Development in the drift from the bottom of the winze continues to show high-grade ore, on each side of which is a streak of milling ore, that is now being placed on the dump for future treatment. The tunnel which is being driven to cut the vein at a depth of 250 ft., is now in 30 feet.

RELIEF (Rochester)—This mine has been reopened by the Treasure Mining Co. The main workings of the old mine consist of four tunnel levels, each in about 300 ft. A winze is now being sunk from the 200-ft. level. A ton sample recently shipped brought a return of $120. This mine has made a large production of silver in the past.

Lyon County

MONTANA-YERINGTON (Yerington)—The unprecedented rains in this district have prevented the regular shipments.

BLUE JAY (Yerington)—The shaft will be retimbered, and development on the 200- and 400-ft. levels will commence. A gasoline hoist will be installed.

SMITH VALLEY MINES CO. (Yerington)—The crosscut from the 160-ft. level is in 8% copper ore rich in gold. The shaft will be sunk to the 200-ft. level.

NEVADA-WASHINGTON (Yerington)—The shaft is 450 ft. deep and is equipped with a 25-hp. gasoline hoist. Lateral development will be started, and possibly a new prospecting shaft will be sunk.

ROSSLAND GROUP (Yerington)—A second shipment of copper-carbonate ore was made recently from this property. It is stated that the ore contains about 8% copper. This property will be a steady shipper this summer.

MASON VALLEY MINES CO. (Thompson)—Recent development at the Mason Valley mine has been satisfactory. On the 70-ft. level below the fourth or main tunnel level a shoot of good-grade copper ore has been exposed. Crosscuts in the upper levels indicate the probability of a long shoot of ore above the second level. Ore receipts at the Thompson smelting plant for the week ended June 5, 1913, were as follows: From Mason Valley mine, 2151 tons, from Nevada-Douglas, 1424 tons, from other mines, 1012 tons; total, 4587 tons, or a daily average of 655 tons. For the same week seven cars of matte were shipped.

Nye County

SHIPMENTS in tons from Tonopah mines for the week ended June 7 were as follows:

Tonopah Mining	3,100	North Star	250
Tonopah Belmont	3,447	Mizpah Extension	...
Montana-Tonopah	1,047	Jim Butler	450
Tonopah Extension	1,130	Tonopah Merger	150
West End	760		
Midway	50	Total	10,937
MacNamara	553	Estimated value	$241,210

NORTH CAROLINA

Stanly County

SOUTHERN ALUMINIUM CO. (Whitney)—At the annual meeting R. Merton was elected a director to succeed Z. Hochschild, deceased, and Paul Brinot was elected to the board to succeed Dr. Paul Heroult. The other retiring directors were reëlected. At a subsequent special meeting of the stockholders of the company the increase in the capital stock from $4,000,000 to $6,000,000 was authorized. The issuance of $6,000,000 bonds also was authorized. The increased capital will be used in extending the scope of the company, enlarging its water power, and increasing its production of aluminum.

OREGON

Josephine County

ORIOLE MINING & MILLING CO. (Galice)—A 10-stamp mill is being built and it is expected that it will be completed in about six weeks.

HORSESHOE BAR (Galice)—This property has closed down for the season because of shortage of water. A successful run was made last season.

ALAMEDA (Galice)—This mine has been partially closed down for about two months, but preparations are now being made for doing considerable development work.

BAILEY GULCH MINING & MILLING CO. (Galice)—Good ore was recently encountered in a crosscut and now the scale of operations will be enlarged. A 14-stamp mill and cyanide plant are in operation.

LITTLE WINDY (Galice)—Operations are going on day and night at this gravel mine, two No. 2 giants being in commission. The operations will have to be stopped later when the water supply is exhausted, but so far rich gravel has been washed.

PENNSYLVANIA

Montgomery County

WARWICK IRON & STEEL CO. (Pottstown)—A new iron-ore sintering plant of the Dwight & Lloyd type has been practically completed at this plant, and will go in operation in the near future. The new plant will operate upon a mixture of flue dust and Mayari ore. The sintering of the Mayari ore will be done to alter its plasticity, which causes some difficulty in mechanically filled stacks. The new plant will have a capacity of 75 tons per day.

UTAH

Juab County

TINTIC SHIPMENTS for the week ended June 6 amounted to 172 cars.

BECK TUNNEL (Knightville)—At the annual meeting no change was made in the directorate. During the last year the company reduced its indebtedness from $2,000 to $3500.

LOWER MAMMOTH (Eureka)—A strong vein has recently been cut on the 2000-ft. level, and drifting on it will soon be started. This vein was cut above on the 1800, where it was 7 or 8 ft. wide, and carried low-grade ore. On the deeper levels some sulphide ore has been encountered.

MAY DAY (Eureka)—This company has decided to discontinue marketing zinc ores on account of the low price of spelter. Shipments of lead from the new orebody between the 1000 and 1100 level will continue. The question of development below the 1100 is being considered, and arrangements may be made for operating through neighboring properties with deeper workings.

COLORADO (Provo)—Development is being done on the 500 level, about 200 ft. below the large ore channel and workings formerly so productive. Several men are working on lower-grade ore in the old stopes, and this ore will probably be sent to the new Knight mill. Work has been discontinued in the American tunnel, which has been driven about 1300 ft. in the western part of the Colorado territory.

KNIGHT-CHRISTENSEN METALLURGICAL CO. (Provo)—This company has recently been formed to take over and to operate the new mill, which is being built by the Knights in the Tintic district to treat low-grade ores from their several properties. The capitalization is $1,000,000 shares, par value 10c. per share. The company will buy and treat ores. The incorporators and directors are: Jesse Knight, president; N. C. Christensen, Jr., W. L. Mangum and R. E. Allen. The mill is being built near Silver City. The concrete work has been finished, and the framework, floors, etc., are being put in. Some of the machinery is now on the ground, and the rest of the mill equipment will be delivered shortly.

WASHINGTON

Chelan County

MOUNT STEWART (Cashmere)—A survey of a road to this mine has been completed and construction work will be begun at once. A gravity tram will be built for 1¼ miles from mine. Bartlett Bros. are owners.

Okanogan County

IVANHOE (Oroville)—Ground has been broken for a 4000-ft. tunnel on this property east of Palmer Lake. Other improvements are to be made.

WISCONSIN

Grant County

CLEVELAND (Hazel Green)—This company has completed the Lawrence shaft and is erecting a 100-ton mill.

WILSON (Potosi)—This company has started operations at the Preston Point mine, and has purchased a Downie deep-well pump to lift the water from the old workings.

GRANT COUNTY (Platteville)—J. M. Nelson, of Davenport, Ia., has subleased this mine under a one-year option and has commenced preliminary work of reopening the mine.

OLD HOMESTEAD (Platteville)—This company has driven its east drift into the W. T. Shepherd land; the company is holding its output and now has an accumulation of 1000 tons of roasted zinc concentrates.

CANADA

British Columbia

WAYSIDE—A gasoline machine drill will be installed at this property near Lillooet.

GALENA HILL—A carload of lead-silver concentrate was shipped from this property during the week of May 25.

ERIE—Development of this property in the New Hazleton district is to be suspended to permit a shipment of ore being made.

FLORENCE SILVER MINING CO.—A Pelton waterwheel, Rand compressor, machine drills and other equipment are to be installed at this property in the Ainsworth district.

INLAND—The 10-stamp mill has been restarted and the superintendent states that a 500-hp. hydro-electric power plant will be added during the summer, and that the mill will be enlarged.

YANKEE GIRL—Heavy shipments of ore are being made from this property at Ymir to the British Columbia Copper Co. smelting works at Greenwood, about four cars having been shipped during the last few weeks.

UNION GROUP—Ore assaying from $20 to $100 per ton, mainly silver, but partly in gold and lead, has been opened in this property at Franklin by L. Johnson and associates. Production has been started and shipments will begin as soon as a connection of 1½ miles is made at Gloucester with the wagon road from Lynch Creek, on the railway, 30 miles away. The ore will be treated at Trail.

BRITISH COLUMBIA COPPER CO.—This company has bonded the following properties in the New Denver district: Little Gam, Spider, Tin Cup, Oriole, Verde, Jennie Silkman and King Solomon. The owners are D. M. French, C. M. and J. Snowdon, T. and C. O. Day, L. G. Barron and S. R. Almond. The company has six diamond drills at work on Copper Mountain where the mines are located.

Ontario

MULHOLLAND (Porcupine)—Steps are being taken toward the reopening of this property.

PENN CANADIAN (Cobalt)—High-grade ore has been encountered in an abandoned stope on the first level.

GOULD (Cobalt)—Seventy feet of cross-cutting has been done in an easterly direction from the 200-ft. level with the object of striking the Seneca-Superior vein.

HOLLINGER RESERVE (Schumacker)—The No. 1 vein, carrying good milling ore, has been encountered in the workings on the 200-ft. level. The company is considering the erection of a mill.

SENECA SUPERIOR (Cobalt)—A winze is being sunk to a depth of 100 ft. from the 200-ft. level on the main vein. If the ore continues at depth a station will be cut and a new level opened.

LUCKY CROSS (Swastika)—The first cleanup at this mine after a run of one month resulted in the production of gold to the value of about $6000. Five additional stamps are being installed, bringing the battery up to 10 stamps.

COBALT-LAKE (Cobalt)—The mill with 40 stamps dropping is treating about 150 tons daily. An oreshoot continuous for 90 ft. has been developed on No. 1 vein, which is supposed to be a continuation of one of the best veins on the Cobalt Townsite property.

McINTYRE (Schumacker)—C. Keith, cleanup man of the mill, was arrested June 10, charged with stealing gold amalgam valued at $1500, which was found in his possession. He was convicted and sentenced to a fine of $500 or one year's imprisonment and on paying the fine was released.

LA ROSE (Cobalt)—The production for May was 209,758 oz. of silver valued at $115,855, the net profit being $84,407. The total profits for the first five months of the year were $388,628. The surplus at the end of May was $1,752,150, of which $1,439,447 was cash and $239,682 in outstanding shipments.

McENANEY (Schumacker)—The Crown Reserve shareholders have approved the action of the directors in making the mine over to a separate company. The property has been transferred to a newly incorporated organization known as the Porcupine Crown Mines, Ltd., capitalized at $2,000,000. Crown Reserve shareholders are offered 440,000 shares in the new company at 80c. per share and the employees are given the opportunity to take up 26,664 shares at the same price. The Porcupine Crown will be governed by the same board of directors as the Crown Reserve.

SHIPMENTS of ore and concentrates in tons, from Cobalt for the week ended June 13, were as follows:

Bailey	.....	La Rose	98.37
Beaver	.....	Lost and Found	.....
Buffalo	.....	McKinley-Darragh	101.16
Casey Cobalt	.....	Nipissing	98.90
Chambers-Ferland	.....	Nipissing Reduction	.....
City of Cobalt	.....	O'Brien	.....
Cobalt Lake	.....	Penn.-Canadian	29.71
Cobalt Townsite	66.44	Provincial	.....
Colonial	.....	Right of Way	.....
Coniagas	.....	Seneca Superior	.....
Crown Reserve	.....	Silver Bar	.....
Dominion Reduction Co.	.....	Silver Cliff	20.00
Drummond	.....	Timiskaming	.....
General Mines	.....	Trethewey	30.72
Green Meehan	.....	Wettlaufer	.....
Hargraves	.....	York	.....
Hudson Bay	.....		
Kerr Lake	30.61	Total	475.91

GERMANY

POTASH SYNDICATE—According to a consular report a number of new potash mining companies, on account of the difficulty of raising money for their development, have entered into negotiations with the Syndicate to suspend work. The terms of their proposals for suspending work are not given.

THE MARKET REPORT

METAL MARKETS

NEW YORK—June 18

The metal markets have been inclined generally to quiet. Price changes have been small, with a slight tendency to weakness, for the most part.

Copper, Tin, Lead and Zinc

Copper—Present indications are that the deadlock in the copper market is about to be broken. The large sellers appear inclined to meet current prices, and if such should turn out to be actually the case, it will doubtless help the situation materially and result in a large volume of business, which has been waiting for some definite trend.

The statistical position of the metal remains excellent, and will probably show a further improvement at the end of this month as a result of labor disturbances at the refinery of the Nichols Copper Co. Nevertheless, consumers remain rather indifferent, both on this side and in Europe, particularly with reference to covering their future requirements. As in all other industries, manufacturers have been exceedingly busy on old orders, but complain that new business shows a large shrinkage. The close is undecided at 14¾@15c. for lake; 14.65@14,75c. for electrolytic in cakes, wirebars or ingots, while casting copper is quoted nominally 14.45@14.50c. as an average for the week.

The standard market has again been under pressure, but the ruling quotations appear to have discounted the conditions prevailing in the market for refined sorts. At the close the tendency is somewhat steadier at £65 for spot and £65 2s. 6d. for three months.

Base price of copper sheets is now 21@22c. per lb. Full extras are charged and higher prices for small quantities. Copper wire is 16@16¼c. per lb., carload lots at mill.

Copper exports from New York for the week were 6963 long tons. Our special correspondent gives the exports from Baltimore at 3578 tons for the week.

Visible stocks of copper in Europe on June 15 are reported as follows: Great Britain, 19,940; France, 3230; Rotterdam, 5050; Hamburg, 3740; Bremen, 1910; total, 33,870 long tons, or 75,868,800 lb., showing an increase of 390 tons over the May 31 report. In addition to the stocks given above 1100 tons are reported afloat from Chile and 5000 tons from Australia, making a total of 39,970 long tons.

Tin—The improvement in the London market the latter part of last week was but short-lived. At the beginning of this week, prices continued to decline, and the market was very weak, both on Monday and Tuesday. Transactions assumed fairly large proportions, but business in this market was small. The close is somewhat firmer at £205 5s. for spot and the same price for three months, with about 44⅞c. for June tin here.

Lead—The market is unchanged at 4.17½@4.20c. St. Louis and 4.30@4.35c. New York.

The Mexican situation is still the dominant factor in the London market, where quotations at the close have advanced to £21 for Spanish lead and £21 7s. 6d. for English. These quotations, however, refer only to spot lead, while future shipments can be had for considerably less.

Spelter—The market is somewhat steadier. There is a little more inclination on the part of consumers to buy for future delivery, now that prices have reached the level where it is recognized that a large portion of the production has to be carried on at a loss. It can therefore be only a question of time when the remedy will have to be applied, either through a larger inquiry or a curtailment in the output, either of which would produce higher prices. The close is unchanged at 4.85@4.95c., St. Louis and 5@5.10c. New York.

Europe still reports a rather demoralized condition in the markets, but the quotation remains at £22 5s. for good ordinaries and £22 12s. 6d. for specials.

Other Metals

Aluminum—The market is quiet and rather irregular. Some low quotations have been made on spot lots, but on the other hand, prices are well held on contract and future business. We quote 24½@25c. per lb. for No. 1 ingots spot; 25½@26½c. for futures.

At the annual meeting of the Southern Aluminum Co. on June 11, R. Merton was chosen a director to succeed Zachary Hochschild, deceased, and Paul Brunot a director to succeed Dr. Paul Heroult. The other directors were reëlected. The stockholders voted to authorize the increase of the capital stock from $4,000,000 to $6,000,000, and the issue of $6,000,000 in bonds.

Antimony—Business is still quiet and no heavy sales are reported. Prices remain about the same. Cookson's is quoted at 8.70@9c. per lb., and Hallett's 8.20@8.50c.; while 7.50@7.80c. per lb. is asked for Hungarian, Chinese and other outside brands.

Quicksilver—The market has been quiet and prices are rather nominal here at $40 per flask of 75 lb., with 60c. per lb. for small orders. San Francisco, $39.50 for domestic orders and 37 for export. London, £7 10s. per flask, with £7 2s. 6d. asked from second hands.

DAILY PRICES OF METALS

NEW YORK

June	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
12	4.8640	59¾	14¾ @15	14.70 @14.80	45¼	4.30 @4.35	4.17½ @4.20	5.00 @5.10	4.85 @4.95
13	4.8650	59⅞	14¾ @15	14.65 @14.75	45⅞	4.30 @4.35	4.17½ @4.20	5.00 @5.10	4.85 @4.95
14	4.8660	59½	14¾ @15	14.65 @14.75	45⅞	4.30 @4.35	4.17½ @4.20	5.00 @5.10	4.85 @4.95
16	4.8675	59¼	14¾ @15	14.65 @14.75	45⅜	4.30 @4.35	4.17½ @4.20	5.00 @5.10	4.85 @4.95
17	4.8685	59¼	14¾ @15	14.65 @14.75	44⅜	4.30 @4.35	4.17½ @4.20	5.00 @5.10	4.85 @4.95
18	4.8680	58⅞	14¾ @15	14.65 @14.75	44⅞	4.30 @4.35	4.17½ @4.20	5.00 @5.10	4.85 @4.95

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

June	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
12	27 5/16	65½	65½	71	208	208	20¼	22¾
13	27¼	65¾	66	71½	209¼	209½	20½	22⅝
14	27¼	....	....	....	....	....	....	....
16	27 5/16	65⅝	66	71½	207¼	207¼	20⅜	22¾
17	27¼	64⅜	65	71¼	203¾	203⅞	20⅜	22⅝
18	27	65	65⅛	71¼	205¼	205¼	21	22¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg. f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Of the supplies arriving a total of £600,000 was taken for Berlin, but the purchases were made without paying any premium.

Gold receipts at the Australian mints four months ended Apr. 30 were: Sydney, 189,257 oz.; Melbourne, 200,850 oz.; Perth, 467,395 oz.; total, 857,502 oz. fine gold, or $17,724,566 in value.

Iridium—No increase in supplies is apparent and the price continues high, at $85 per oz., New York.

The reported discovery of a large deposit of osmiridium in Tasmania is in doubt. The Mines Department reports that much farther development is needed. So far only a few small pockets of ore have been found.

Platinum—Business is rather quiet, but steady, and prices remain firm at $45@46 for refined platinum, and $49@52 per oz. for hard metal.

Our Russian correspondent reports that there is no materialchange in the market. Quotations at Ekaterinberg are 9.75 rubles per zolotnik for crude metal, 83% platinum; at St. Petersburg 37,800 rubles per pood for the same grade. These prices are equivalent to $36.66 and $37.04 per oz. The small lots offered by the starateli are quickly taken up by speculators; an advance in prices is expected. It is reported that several companies are being organized to lease large tracts of platinum bearing gravels, and to work them on a good scale, with modern appliances.

Silver—Owing to stringency in the money market London price of Silver has declined. There has been a disposition to operate for a decline, as shown by China occasionally selling and also by the Indian bazaars doing the same thing. Inquiry at the decline, however, continues good.

Exports of silver from London to the East, Jan. 1 to June 5, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£2,989,800	£3,421,000	I. £431,200
China	853,500	309,500	D. 544,000
Total	£3,843,300	£3,730,500	D. £112,800

Exports of silver from New York, week ended June 14 were $882,991, nearly all to London. Imports were $166,085, from Mexico, Central and South America.

Exports of gold from New York week ended June 14 were $237,492, mainly to Amsterdam; imports were $331,779.

Zinc and Lead Ore Markets

JOPLIN, MO.—June 14

The high price of zinc blende is $46, the base per ton of 60% ranging from $40 to $43. Excess iron ore sold on a $44 base price. Calamine sold on a base of $20@23 per ton of 40% zinc. On account of a heavy shipment of calamine the average of all grades dropped to $39.20 per ton. Lead is still $52.50 per ton of 80% metal contents, and the average of all grades is $52.30 per ton.

SHIPMENTS WEEK ENDED JUNE 14

	Blende	Calamine	Lead ore	Value
Totals this week ..	10,889,780	1,308,890	1,742,040	$284,653
Totals 24 weeks ..	263,212,760	17,941,970	44,081,320	$7,394,657

Blende value, the week, $223,825; 24 weeks, $6,000,817.

Calamine value, the week, $15,273; 24 weeks, $235,122.

Lead value, the week, $45,555; 24 weeks, $1,159,018.

PLATTEVILLE, WIS.—June 14

The base price paid this week for 60% zinc ore was $42 per ton. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED JUNE 14

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	4,150,060	180,440	798,610
Year to date	67,011,740	3,379,870	29,156,830

Shipped during week to separating plants, 2,239,940 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—June 18

The iron and steel market as a whole shows no important developments. New business by way of contracts continues extremely light, while specifications on old contracts are perhaps slightly decreased. Production of steel continues at substantially the full capacity, and this fact, with the continuance of good crop prospects and the fairly rigid maintenance of prices, together with a slightly firmer tone in pig iron, may account for the better undertone in sentiment which has been apparent in the past week.

Steel prices continue firm almost all along the line. Sheets show the most irregularity, black sheets have declined $1 a ton further in the week. Definite cuts in wire products would probably be shown if there were any demand.

The most prominent fact in the steel market position is that consumption continues at practically record rate. Steel mill shipments have decreased little, if at all, and jobbers are taking material freely as they enjoy an excellent distributing business, so that there is every indication that the country is using a full tonnage, even though it is buying little. A fresh buying movement, it is held in many quarters, will actually be forced shortly by these conditions.

Exports and Imports of Iron and Steel and of manufactures thereof in the United States, four months ended Apr. 30, are valued by the Department of Commerce and Labor, as below:

	1912	1913	Changes
Exports	$88,095,263	$103,551,221	I. $15,455,958
Imports	8,543,040	11,312,190	I. 2,769,150
Excess, exports	$79,552,223	$92,239,031	I. $12,686,808

Actual tonnages of iron and steel so far as given in the reports, were 942,076 tons in 1912, and 1,008,899 in 1913; increase 66,823 tons. Tonnage of imports was 59,577 in 1912, and 99,635, in 1913; increase, 40,058 tons. In some important lines only values, not quantities, are given.

PITTSBURGH—June 17

All indications point to there being a better feeling in the finished steel trade this week, though there can be no more than a sentimental improvement, seeing that new business continues light and specifications on old contracts have, if anything, decreased further. The strength of the position lies in the fact that the mills are able to maintain full operation merely with their old business. While there have been cancelations and postponements, there have been unimportant, and have prooably not amounted, in the past 30 days, to 5% of the total business specified on books. Specifications are being filed at about two-thirds the rate of outgoing shipments.

Monday morning an agreement was reached on the iron mill wage scales between the Western Bar Iron Association and the Amalgamated Association, in conference at West Baden, Ind. There will be a conference with the Republic Iron & Steel Co. in Pittsburgh, June 26, at which the association settlement will doubtless be accepted. The settlement is on the basis that rates are not changed as long as bar iron is between 1.00 and 1.25c., but on bar iron at 1.30c. and upward the rates advance. Thus the puddling rate with bar iron at 1.25c. remains at $6, but for 1.30c. bar iron it becomes $6.20 instead of $6.15.

Pig Iron—Prices are more stiffly held. It is related that a large consumer a fortnight ago bought 500 tons of foundry iron at $13.75, Valley, this being under the market quotations and not reported in the trade at the time, but now can secure no lower quotation than $14.25. A large maker of basic has withdrawn $14.50 and now quotes $15. The Colonial Steel Co. purchased 1500 tons basic at $14.50, Valley, the specification as to sulphur being a trifle strict, but not enough to involve a premium. Foundry iron is selling rather freely in small lots. A sale of 500 tons of bessemer at $16.50, Valley, confirms the previous quotation at this figure. We repeat former quotations: Bessemer, $16.50; basic, $14.50; No. 2 foundry, $14.25; malleable, $14.25; forge, $13.75@14, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market continues quiet. We quote prompt at $60 and contract at $61, Baltimore, with $2.16 freight to Pittsburgh.

Steel—The market has shown surprising stiffness. Prompt lots of both billets and sheet bars command premiums, but there is no inquiry for prompt sheet bars and only moderate inquiry for prompt billets. Buyers are somewhat slow in

taking hold for third quarter, finding it impossible to shade former quotations. We quote billets at $26.50 and sheet bars at $27, maker's mill, Pittsburgh and Youngstown, with most sellers quoting 50c. higher.

IRON ORE

Of the total movement of iron ore—7,284,212 tons—from Lake Superior in May, 5,378,814 tons, or 76.6% of the total, went to Lake Erie ports.

Imports and exports of iron ore in the United States four months ended Apr. 30, long tons:

	1912	1913	Changes
Imports	619,782	703,224	I. 83,442
Exports	27,338	28,828	I. 1,490

Imports of manganese ore for the four months were 90,120 tons in 1912, and 164,339 in 1913; increase, 74,219 tons.

Imports of Iron Ore in Germany four months ended April 30 were 4,324,685 metric tons; exports, 806,011 tons. Imports of manganese ore for the four months were 238,867 tons; exports, 3067 tons.

COKE

Production in the Connellsville region is steady. Prices of spot coke are a shade easier. There has also been some easing in the prices asked for second-half furnace contracts. West Virginia coke shows an improving demand.

Coal Passing through Sault Ste. Marie canals for the season to June 1, in short tons:

	1912	1913	Changes
Anthracite	17,848	636,159	I. 618,311
Bituminous	1,653,022	2,890,789	I. 1,237,767
Total	1,670,870	3,526,948	I. 1,856,078

The very large increase shown was partly due to the absence of anthracite shipments last year, and partly to the earlier opening of navigation this year.

SAULT STE. MARIE CANALS

The total freight passing through the Sault Ste. Marie canals in May was 11,376,195 tons, a record for the month. From the opening of the season to June 1 the total movement was as follows, in short tons:

	1912	1913	Changes
East-bound	7,128,152	9,430,301	I. 2,302,149
West-bound	1,975,459	3,851,449	I. 1,875,990
Total	9,103,611	13,281,750	I. 4,178,139

The number of vessel passages this year was 3767, showing an average cargo of 3526 tons.

Mineral freights included above were as follows, also in short tons, except salt, which is given in barrels:

	1912	1913	Changes
Coal	1,670,870	3,526,948	I. 1,856,078
Iron ore	5,546,715	7,308,544	I. 1,761,829
Pig and manuf. iron	113,807	89,548	D. 24,259
Copper	19,785	18,910	D. 875
Building stone	2,282	.....	D. 2,282
Salt, bbl.	219,022	181,095	D. 37,927

Iron ore was 55% and coal 26.6% of the total freight this year.

CHEMICALS

NEW YORK—June 18

General business is rather quiet and the usual summer dullness is settling over the market.

Imports and Exports of Chemicals and raw materials in the United States, four months ended Apr. 30, were as follows:

	Imports		Exports	
	1912	1913	1912	1913
Arsenic, lb.	1,570,988	2,945,826	.....	.....
Copper sulphate, lb.	.....	.....	4,917,730	3,141,018
Bleach, lb.	27,170,251	26,417,957	400	1,180
Potash salts, lb.	223,798,507	215,383,296	1,337,817	3,898,777
Soda salts, lb.	3,982,814	5,077,844	169,261	109,442
Acetate of lime, lb.	.....	.....	22,509,463	24,972,275
Nitrate of soda, tons	142,765	225,109	3,317	1,541
Sulph. of ammonia, lb.	47,912,690	51,541,399	134,715	.....
Phosphate, tons	.....	.....	336,333	330,723
Sulphur, tons	6,863	2,622	11,056	25,113
Pyrites, tons	290,559	360,695	.....	.....
Magnesite, lb.	69,130,385	107,969,981	553,150	1,006,710
Chrome ore, tons	18,349	20,379	.....	.....

Exports include reëxports of foreign material. Some phosphate rock is imported, but is not given separately in the trade returns.

Arsenic—Sales have been small and receipts steady, so that stocks are piling up. Prices are weaker, $3.25@3.50 per 100 lb. being paid.

Copper Sulphate—Trade is good and prices are steady at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

Nitrate of Soda—The market has fallen into summer dullness and business is quiet. Quotations are easier, 2.45c. per lb. being named for spot; 2.40c. per lb. for July and later deliveries.

PETROLEUM

The annual report of the Shell Transport & Trading Co., the chief European petroleum competitor of the Standard, shows a considerable gain in profits for 1912 over the preceding year.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield ther is reckoned at 97%. In computing the total American supply duplications are excluded.

	Jan.	Feb.	March	April	May
Alaska shipments	1,668,328	660,250	472,293	1,730,252	1,771,508
Anaconda	21,000,000	21,250,000	22,900,000	23,800,000	25,600,000
Arizona, Ltd.	3,100,000	3,000,000	3,200,000	3,100,000	3,200,000
Copper Queen	7,554,966	6,810,706	7,558,709	8,210,166	8,301,605
Calumet & Ariz.	4,750,000	4,050,000	4,250,000	4,500,000	4,300,000
Chino	3,298,030	3,898,998	4,464,723	3,925,409	3,883,611
Detroit	1,769,071	1,689,277	1,640,671	1,856,517	2,001,633
East Butte	1,469,000	1,325,000	1,400,000	1,400,000	.....
Mammoth	1,957,804	1,661,150	1,641,091	1,450,000	1,700,000
Giroux	650,000	*600,000	*625,000	*600,000	.....
Mason Valley	1,655,319	1,348,070	1,608,492	1,264,304	.....
Miami	.....	.....	.....	.....	1,943,900
Nevada Con.	4,169,705	4,798,537	5,555,320	5,650,608	.....
Ohio	492,760	380,849	596,651	690,001	.....
Old Dominion	2,727,000	2,381,000	2,853,000	3,040,000	2,749,000
Ray	3,610,000	3,610,000	4,287,400	4,379,128	4,384,400
Shannon	1,232,000	1,152,000	1,260,000	1,238,000	1,080,000
Tennessee	1,824,637	1,600,151	1,796,394	1,718,188	.....
United Verde*	2,900,000	2,750,000	3,000,000	3,000,000	.....
Utah Copper Co.	7,333,495	7,585,303	8,248,880	9,539,847	10,003,227
Lake Superior*	17,500,000	19,000,000	19,000,000	17,000,000	18,750,000
Non-rep. mines*	5,675,363	5,399,849	6,203,606	6,000,000	6,200,000
Total prod.	96,337,478	94,950,141	102,562,230	104,092,420	.....
Imports, bars, etc.	34,026,236	21,372,292	24,215,480	25,578,297	.....
Total blister	130,363,714	116,318,433	126,777,710	129,670,717	.....
Imp. ore & matte	7,563,758	9,459,432	11,911,041	7,177,363	.....
Total Amer.	137,927,472	125,781,865	138,688,751	136,848,080	.....
Miami†	2,932,369	2,817,200	3,102,200	2,312,900	.....
Shattuck-Arizona	1,381,422	1,136,480	1,234,450	1,158,326	1,026,170
Brit. Col. Cos.:					
British Col. Cop.	720,260	688,312	844,735	794,000	.....
Granby	1,792,245	1,740,000	1,967,962	1,857,452	1,828,000
Mexican Cos.:					
Boleo†	2,658,880	2,535,680	2,204,720	2,811,200	2,424,800
Cananea	5,450,000	4,880,000	4,772,000	3,581,690	2,272,000
Moctezuma	2,913,294	2,730,914	3,062,159	2,753,240	2,695,881
Other Foreign:					
Braden, Chile	1,484,000	1,178,000	1,472,000	1,512,000	1,150,000
Cape Cop., S. Af.	770,540	712,320	732,480	586,880	387,520
Kyshtim, Russia	1,644,160	1,352,960	1,478,400	2,544,640	.....
Spassky, Russia	974,400	1,003,520	974,400	974,400	.....
Exports from					
Chile	6,752,000	5,824,000	7,840,000	7,616,000	3,584,000
Australia	9,744,000	5,512,000	6,944,000	6,608,000	7,840,000
Arrivals—Europ‡	17,689,280	8,509,760	15,585,920	10,545,920	13,661,760

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines.

‡ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	United States: U.S.Refin'y Production	United States: Deliveries, Domestic	United States: Deliveries, for Export	Visible Stocks: United States	Visible Stocks: Europe	Visible Stocks: Total
V, '12.	126,737,836	72,702,277	69,485,945	65,066,029	134,176,000	199,242,029
VI.	122,315,240	66,146,229	61,449,650	49,615,643	117,801,600	167,417,244
VII.	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	.....	.....	.....	67,474,225	77,235,200	144,709,425

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq	Sale	Amt.
Big Elk, Ida	June 10	July 10	$0.001
Booth, Nev	May 19	June 23	0.02
Cedar Creek, Ida	May 3	July 3	0.005
Central Eureka, Calif	June 6	July 5	0.02½
East Hecla, Ida	June 18	July 25	0.003
Houghton Copper, Mich	.....	July 15	1.00
Hypotheek, Ida	June 20	July 14	0.004
Imperial, Ida	June 2	.....	0.002½
Lone Star, Nev	May 29	July 3	0.01
Majestic, Ida	June 2	June 25	0.303
Mayflower, Ida	May 22	June 26	0.005
Middle Swansea, Utah	June 12	July 3	0.001
Mineral Farm, Ida	June 7	July 7	0.002
New Arcadian, Mich	.....	July 1	0.50
New Yerington, Nev	June 10	June 28	0.01
Old Evergreen, Utah	June 17	July 17	0.01
Raven, Mont	.....	June 25	0.15
Relonia, Utah	May 24	June 24	0.0005
Royal, Ida	May 31	June 23	0.001
Samson, Ida	May 1	July 1	0.002
Sierra Nevada, Nev	June 24	July 15	0.10
Silver Flat, Utah	June 23	July 7	0.001
Silver Pick, Nev	June 23	July 28	0.01
Tintic Standard, Utah	June 21	July 19	0.005
Tuscumbia, Ida	Apr. 26	July 10	0.001
Union Chief, Utah	.....	.....	0.01
Utah Mine, Utah	June 7	June 26	0.05

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59 490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	.....	24.486	28.215	.....
July	52.630	60.654	.....	24.286	27.919	.....
August	52.171	61.606	.....	24.082	28.375	.....
September	52.440	63.078	.....	24.209	29 088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16 767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14 713	14.868	14.930	65.884	65.329
April	15 741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16 245	15.738	72.352	68.807
June	17 234	.....	17 443	.....	78.259	.....
July	17.190	.....	17.353	.....	76.636	.....
August	17.498	.....	17.644	.....	78 670	.....
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	.....	205.863	.....
July	44.519	.....	202.446	.....
August	45.857	.....	208.351	.....
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3 946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4 118	4.242	16.331	17.597
May	4.194	4.342	4 072	4.226	16.509	18.923
June	4 392	.....	4.321	.....	17.588	.....
July	4 720	.....	4.603	.....	18 544	.....
August	4.569	.....	4 452	.....	19 655	.....
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6 089	26 661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6 483	5.491	25 644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	.....	6 727	.....	25.763	.....
July	7.116	.....	6 966	.....	26 174	.....
August	7.028	.....	6.878	.....	26.443	.....
September	7.454	.....	7 313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7 371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26 494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	.....	14.11	.....	14.22	.....
July	15.15	.....	14.38	.....	14.38	.....
August	15.43	.....	14.90	.....	14.85	.....
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS June 16

Name of Comp.	Bid.
Acacia	‡.02¾
Cripple Cr'k Con.	‡.01
C. K. & N.	‡.12½
Doctor Jack Pot.	.06½
Elkton Con	.53
El Paso	3.25
Findlay	‡.03
Gold Dollar	.10
Gold Sovereign	‡.02⅜
Isabella	.10
Jack Pot	.05½
Jennie Sample	‡.05½
Lexington	‡.008
Moon Anchor	‡.01
Old Gold	.02
Mary McKinney	.57
Pharmacist	‡.01½
Portland	.95½
Vindicator	90
Work	‡.004

SALT LAKE June 17

Name of Comp.	Bid.
Beck Tunnel	.04
Black Jack	.08
Cedar Talisman	.01
Colorado Mining	.12½
Columbus Con	.07½
Crown Point	.01½
Daly-Judge	6.40
Grand Central	.58
Iron Blossom	1.25
Little Bell	.10
Lower Mammoth	.02½
Mason Valley	5.00
May Day	.05¾
Nevada Hills	.90
New York	.02½
Prince Con	.35
Silver King Coal'n	3.15
Sioux Con	.02½
Uncle Sam	.05½
Yankee	.07½

TORONTO June 16

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.08½	Foley O'Brien	.23
Coniagas	7.25	Hollinger	15.90
T. & Hudson Bay	67.00	Imperial	‡.03
Timiskaming	.34	Jupiter	.34
Wettlaufer-Lor	.10	Pearl Lake	.35
Apex	‡.01	Porcu. Gold	.11½
Crown Chartered	.00½	Preston E. D.	.03½
Dobie	‡.25	Rea	.12
Dome	‡15.00	Swastika	.05
Dome Exten	.09½	West Dome	‡.12

SAN FRANCISCO June 17

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.03	Belmont	6.15
Belcher	.16	Jim Butler	.69
Best & Belcher	.03	MacNamara	.16
Caledonia	.90	Midway	.39
Challenge Con	.01	Mont.-Tonopah	1.30
Chollar	‡.01	North Star	.81
Confidence	‡.23	West End Con	1.20
Con. Virginia	.03	Atlanta	.14
Crown Point	.20	Booth	.03
Gould & Curry	.02	C.O.D. Con	.03
Hale & Norcross	.05	Comb. Frac	.03
Mexican	.66	Jumbo Extension	.23
Occidental	.70	Pitts.-Silver Peak	.45
Ophir	.07	Silver Pick	.03
Overman	.30	St. Ives	‡.30
Potosi	.01	Tramp Con	‡.01
Savage	.10	Argonaut	‡1.60
Sierra Nevada	.03	Bunker Hill	‡1.90
Union Con	.05	Central Eureka	‡.12
Yellow Jacket	.22	So. Eureka	‡2.75

N. Y. EXCH. June 17

Name of Comp.	Clg.
Amalgamated	65¾
Am. Agri. Chem	47
Am.Sm.&Ref.,com	63½
Am. Sm. & Ref., pf.	98½
Am. Sm. Sec., pf. B	81
Anaconda	33¾
Batopilas Min	1
BethlehemSteelpf	64
Chino	34½
Federal M. & S., pf.	33½
GreatNor.,ore,,ctf.	29
Guggen. Exp	42
Homestake	102
Inspiration Con	14¾
Miami Copper	21¼
Nat'nalLead,com.	47
National Lead, pf.	105
Nev. Consol	15
Phelps Dodge	195
Pittsburg Coal, pf.	75⅞
Ray Con	17¼
Republic I&S,com.	18⅞
Republic I & S, pf.	75
SlossSheffil'd,com.	24½
Sloss Sheffield, pf.	85½
Tennessee Copper	29⅜
Utah Copper	41¾
U. S. Steel, com	53¼
U. S. Steel, pf.	103¾
Va.Car. Chem., pf.	99¾

N. Y. CURB June 17

Name of Comp.	Clg.
Barnes King	1¼
Beaver Con	.33
Big Four	⅛
Braden Copper	6⅛
B. C. Copper	2⅛
Buffalo Mines	2¼
Can. G. & S.	23
Con. Ariz. Sm.	⅝
Davis-Daly	15/16
Diam'field-Daisy	.02
Ely Con	06
Florence	.35
Giroux	1⅝
Gold Hill Con	1¼
Goldfield Con	1⅞
Greene Cananea	6
Greenwater	04½
Internat. S. & R.	‡109
Kerr Lake	3⅜
Keystone	‡2
La Rose	2⅜
McKinley-Dar-Sa	1⅝
Min. Co. of A. new	2½
Motherlode Gold	‡.60
Nipissing Mines	8½
Ohio Copper	⅝
Pacific Sm. & M	1/16
Puebla S. & R.	1⅞
South Live Oak	‡2
South Utah M. & S.	¼
Stand'd Oil of N.J.	346
Stewart	1½
Tonopah	4⅝
Tonopah Ex	2
Tonopah Merger	.69
Tri-Bullion	⅛
Tularosa	⅝
Union Mines	1/16
United Cop., pfd.	3
Yukon Gold	2⅜

BOSTON EXCH. June 16

Name of Comp.	Clg.
Adventure	1¼
Ahmeek	285
Alaska Gold M	10
Algomah	1¼
Allouez	30½
Am. Zinc	19½
Ariz. Com., ctfs.	2⅝
Bonanza	.30
Boston & Corbin	.55
Butte & Balak	1⅝
Calumet & Ariz	59¼
Calumet & Hecla	410
Centennial	11
Cliff	1½
Copper Range	40
Daly West	2½
East Butte	9¾
Franklin	5½
Granby	54½
Hancock	14½
Hedley Gold	30
Helvetia	.40
Indiana	6
Island Cr'k, com	45½
Island Cr'k, pfd.	80½
Isle Royale	17⅛
Keweenaw	1½
Lake	6¼
La Salle	3⅜
Mass	2¾
Michigan	1
Mohawk	45
New Arcadian	3/
New Idria Quick	‡3⅞
North Butte	24⅜
North Lake	1¼
Ojibway	.61
Old Dominion	43
Osceola	78
Quincy	56
Shannon	7¾
Shattuck-Ariz	23½
Superior	25¼
Superior & Bost.	2⅝
Tamarack	23
Trinity	3
Tuolumne	2
U. S. Smelting	35
U. S. Smelt'g, pf.	46½
Utah Apex	1½
Utah Con	7½
Victoria	.90
Winona	1¼
Wolverine	45
Wyandot	.60

LONDON June 7

Name of Com.	Clg.
Camp Bird	£0 18s 0d
El Oro	0 14 3
Esperanza	0 19 4½
Mexico Mines	5 17 6
Oriental Con.	‡1 8 4
Oroville	0 6 0
Santa Gert'dis	1 5 0
Tomboy	1 7 6

BOSTON CURB June 16

Name of Comp.	Last
Bingham Mines	3
Boston Ely	⅛
Boswycocolo	‡.01
Butte Central	.35
Cactus	.03
Calaveras	2⅞
Chief Cons	1½
Corbin	‡.60
Cortez	.30
Crown Reserve	3⅜
Eagle & Blue Bell	.85
First Nat. Cop	1⅞
Houghton Copper	1½
Majestic	.37
Mexican Metals	.44
Moneta Porc	‡.06
Nevada-Douglas	1⅞
New Baltic	.70
Oneco	.78
Raven Copper	.02½
Rhode Island Coal	02
Smokey Dev	⅛
S. W. Miami	2
South Lake	4½
Trethewey	‡.33
United Verde Ext.	.55

‡Last quotation.